Quality and equity in Brazilian basic education: facts and possibilities[1]

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Introduction

Brazilian Education is organized in five levels: Infant, Fundamental, Secondary, Higher and Postgraduate Education. The first three are often referred to as Basic Education, and the last two as Higher Education. This unique terminology, particularly the one adopted for basic education, often gives rise to confusion when comparisons are made with other countries.

Primary education is compulsory for children aged 7 to 14 and free at all public institutions, included for those who did not have access to school at the appropriate age. Although access to schools has largely been achieved, the very high rates of grade repetition, as well as of truancy and school evasion show that for the majority of the population, the system is not providing the education required for responsible citizenship and entry into the formal workforce. The main purpose of this paper is to present a description and a critical appraisal of the status of this level of education.

Today there is data of good quality to describe every level of the Brazilian educational system. A comprehensive overview is given by Castro (Castro 1999), where both the national evaluation efforts and the information systems of INEP- MEC are described.

This paper uses data from 2001 cycle of the National System for Evaluation of Basic Education (SAEB), to describe the Brazilian Basic Education and to produce evidence supporting some school policies that could help improving the quality and equity of this level of education in Brazil.

The Basic School: Its outcomes and problems

Even before the 1988 Brazilian Constitution ensured the principle of free access to compulsory education as a citizen's right, the federal, state and municipal governments have been prioritizing programs to build schools and to hire teachers to work with children aged 7 to 14. As a result Brazil has today a large system of primary education.

Table 1 shows the number of schools and Table 2 the enrollment, based on the 2002 Educational Census. Relating these data to the 2000 population census, it can be seen that almost all Brazilian children aged between 7 and 14 are enrolled in basic school. Actually,

there are a much higher number of children enrolled at primary school than the number of children in this age group, 35 million against 28 million. This is an evidence of not only the high repetition rate, but also of late entry, evasion and student's dropout. It should be observed that most students go to public schools. However, it is the private system, which responds only to 9% of the students that receive almost all students from higher socio-economic status. Another aspect to be taken into consideration is the large number of small rural schools, and their geographical isolation.

Table 1: Number of Schools by School Type

School Type	Educational Level	
	Primary	Secondary
Public	159,228	13,916
Private	18,552	6,304
Urban	70,410	19,399
Rural	107,370	821
Total	177,780	20,220

Table 2: Enrollment Numbers

Enrollment	Educational Level	
	Primary	Secondary
Male	18,017,980	3,826,466
Female	17,280,109	4,571,542
Public	32,089,803	7,283,528
Private	3,208,286	1,114,480
Urban	28,864,106	8,269,981
Rural	6,433,983	128,027
Morning	31,891,584	4,093,373
evening	3,406,505	4,304,635
Total	35,298,089	8,398,008

Access to school, although essential, is not enough to fulfill any educational need. For that the child must attend a good school on a regular basis. Therefore the quality of an education system should be first assessed through indicators, which take into consideration attendance, evasion, and promotion to the next grade and conclusion of primary education.

There is no reliable data describing the present situation concerning attendance to basic education schools despite the fact that the law establishes compulsory presence of at least

75% of the school's days. Through our contacts with public school basic education teachers, we have anecdotal evidence that the absence rate is high. The situation has been made worse due to recent misguided implementations of projects to reduce grade repetition. Some of those projects sent the wrong message to students, i.e. they will be promoted no matter what they do. Since the society often values grade completion, more than learning, the school attendance and involvement lost priority, since the diploma was secured by the new rules.

To measure grade repetition, evasion and conclusion, there is reliable data obtained through the Educational Census. By law, every school should fill out the census questionnaires. The National Institute of Educational Studies and Research (INEP), an agency of the Ministry of Education (MEC), processes the data collected and produce useful indicators. While these indicators describe the basic conditions necessary for an educational system, they cannot be taken as real indicators of quality in education.

There is a national education law, known as the "'National Educational Guidelines and Framework Law", that provides elements to understand what the legislator understands as quality education. It establishes that the primary education will aim at the basic formative stage of the individual through:
1. the development of learning capability by means of a comprehensive ability to read, write and calculate;
2. the understanding of the natural and social environments, the political system, the technology, the arts and the values in which the society is based on;
3. the development of the learning capability, having in mind the acquisition of not only knowledge and skills, but also the attainment of attitudes and values;
4. the strengthening of family ties, human solidarity and mutual understanding in which social life is based on.

The legislator very clearly points out that education should provide the student with opportunities to achieve goals related to cognitive, vocational, social and personal aspects of his/her life. When this is achieved it is said that the student had access to "quality education". In order to ensure the supply of a "quality education", the federal government created an evaluation system: the National System for Evaluation of Basic Education (SAEB), which, however, collects data related only of the cognitive aspects of the education system. Besides the difficulty of collecting data on the other aspects of education, this option is justified by the fact that the other goals cannot be attained if the

students do not acquire the reading and mathematical abilities. The other goals of the education are not responsibility of the school system alone, but also of the families, and other society organizations.

SAEB - National System for Evaluation of Basic Education

SAEB is the national system for evaluation of the basic education in Brazil. It is based on a rigorous sample methodology. It started in 1990 and has been carried out on a bi-annual basis since 1993. SAEB evaluates students from the last year of each cycle on both Primary and Secondary levels. The levels evaluated are the 4th and 8th year of Primary Education and the senior (third) year of Secondary Education.

The students are tested on Portuguese Language and Mathematics. Besides the tests, they also fill out a questionnaire with data on socio-economic status, learning behavior and parents´ participation in the educational activities. Teachers also answer questionnaires on teaching practices, management and socio-economic background. The information collected on individual students and schools is confidential; and results are only published at national, regional and state levels of aggregations.

The test aims at evaluating cognitive processes rather than just content. It examines the abilities expected from the students at each level of education. The tests specifications are based on the National Curricular Parameters (PCN) and the National Educational Guidelines and Framework Law (LDB). These specifications are the result of a thorough national consultation with teachers, researchers and specialists.

SAEB's results are supposed to subsidize the elaboration of educational policies in the federal, state and municipal levels of government, helping to identify the school and teaching processes variables associated to the learning.

To guarantee the inclusion of items related to all the cognitive processes, SAEB tests are organized in such a way that different students take different tests, but with common items. The students' proficiency is the estimate of a parameter from an Item Response Theory model. The test preparation includes common items for all the different grades and years tested. Therefore the proficiency of students tested in the SAEB in different cycles and grades are on the same scale. Obviously, senior high school students are expected to do

better than 4th grade ones. The proficiency methodology is described in (Klein and Fontanive 1995). In terms of proficiency measurement, SAEB is a particularly well-designed tool.[2]

In this paper we use data from SAEB 2001, mainly the 8th grade Mathematics results. This option reflects the known fact that proficiency in Mathematics depends more on school quality than Language proficiency. All analysis presented are based on the data from 50300 students, 5151 classes, 4922 teachers, and 4065 schools from state, municipal and private sectors from every Brazilian state and the federal district.

Brazilian Basic Education Quality

The proficiency evaluated by the SAEB assesses adequately the level of cognitive skills and competence considered necessary for a basic education student.

Figure 1 - Math Proficiency by Grade

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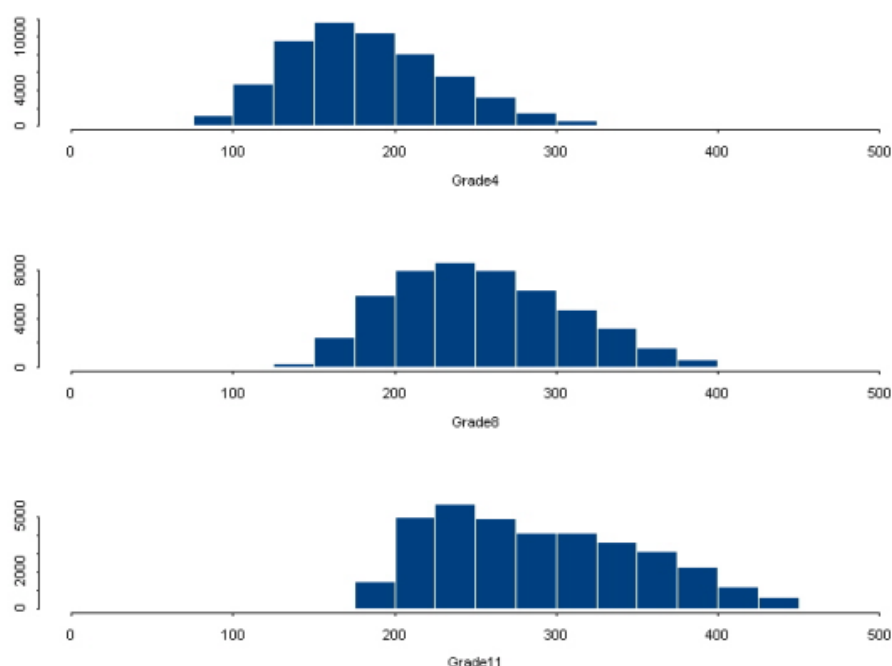
[2] There is an increasing literature on SAEB. To understand the sampling aspects used, look up the survey sample plan in (Andrade, Silva, and Bussab 2001). Franco (Franco 2001) puts together a collection of critical reflection articles on SAEB 1999. Bonanimo' book (Bonamino 2002) is the most comprehensive one, giving a historical evolution synthesis, a description of the methodologies used and the impact of this system. SAEB 2001. Planning can be found in (Locatelli 2002), along with the final report main results, published by INEP. SAEB's two first cycles are evaluated in (Crespo, Soares, and Mello e Souza 2000).

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Figure 1 depicts the math proficiency histograms for the three grades tested. Firstly, it should be noted that the three graphs overlap, demonstrating that in all grades there are students whose ability levels are compatible with more or less advanced classes. It should be particularly noticed the big overlapping between the results of the 8th grade (Primary Education) with those from the secondary education senior year. This indicates that the secondary education is adding little, in cognitive terms, to the students.

Table 4, taken from the SAEB 1997 official report, shows, for each grade, the expected levels of performance for each school year. Although the methodology used to establish these levels has not been properly described, this is the only reference available. As it can be seen in Figure 1, students' overall performance is much below the values considered appropriate. It means that the vast majority of Brazilian students have not acquired the cognitive skills expected for their grades. Therefore, the Brazilian educational system has problems not only with student's flow, as shown before, but also serious ones in relation to quality of what the students learn.

Table 4: Expected Proficiency Levels by Grade

Levels	Grade
100	Not significant
175	End of Primary School's Grade 2
250	End of Primary School's Grade 4
325	End of Primary School's Grade 8
400	End of Secondary School's Grade 3

In the remaining sections of this paper we are going to consider mainly the 8th grade math results, which are shown in the second histogram of Figure 1. The standard deviation value of this distribution is 50 points. This gives us a reference against which to measure the impact of these factors. A 25 points effect is equivalent to a proficiency distribution shift of a half standard deviation, something comparable to a one-school grade.

Figures 2 and 3 show the boxplots[3] results for students categorized by gender, geographical location, and color and school systems. There are big differences to be noticed. The boys

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[3] **Boxplots** (often called "box and whisker" plots) are a way of presenting the shape, central value and variability of the distribution of scores of a group of students. **The median** is such that half of all patients get a score higher than the median, and 50% get a score lower. The median splits the data into two parts. The median of the lower half of the data is the **first quartile** is, i.e., the point at which 25% of the patients score lower (and 75% score higher). The median of the upper half of the data is the **the third quartile** is, i.e. the point at which 75% of the patients score lower (and 25% score higher). The "box" in a boxplot shows the

have a little better median proficiency than the girls, the blacks fall behind the students from other colors, including the mulatto ones. Reflecting known Brazilian regional differences, the Southeast and South have higher median proficiencies than the other regions and, finally, the private schools have a very large advantage with relation to either the state or municipal schools. All those differences have been reduced in several societies and so the same can occur in Brazil.

Figure 2: Math Proficiency by Sex and Race

Figure 3: Math Proficiency by School Type and Region
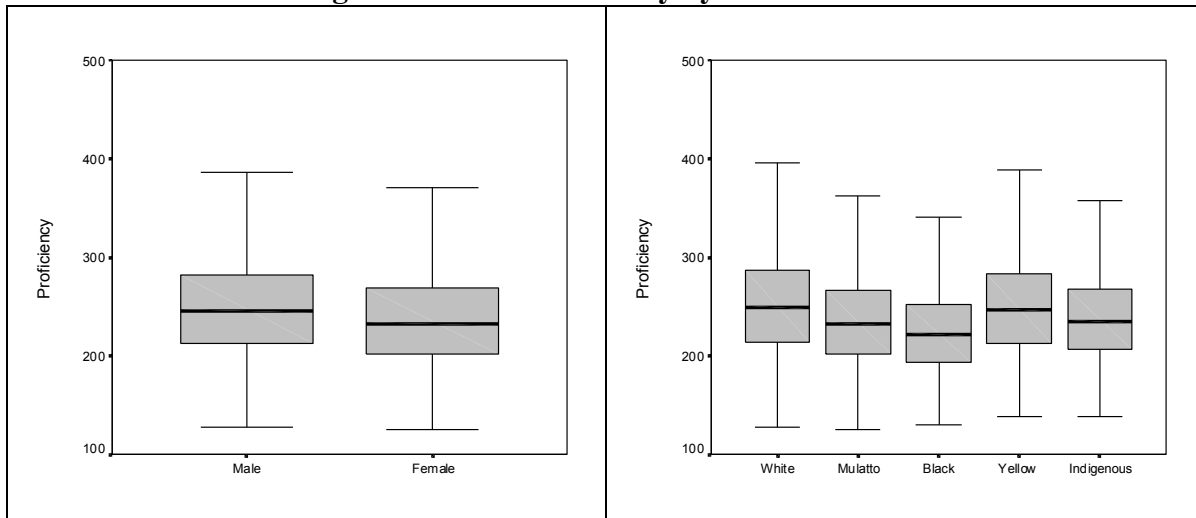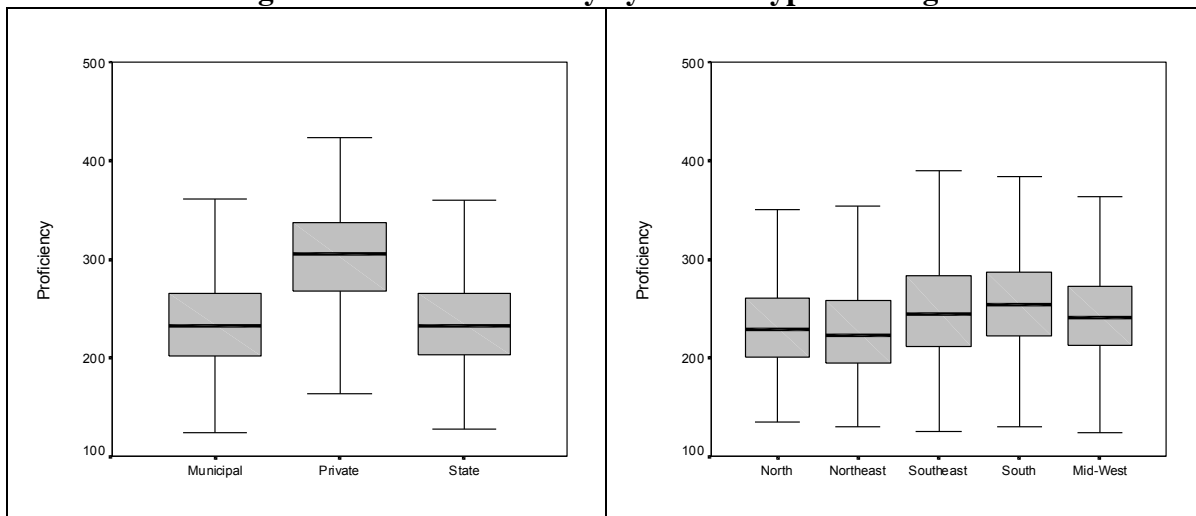

median score as a line and the first and third quartile of the score distribution as the lower and upper parts of the box. The **"whiskers"** shown above and below the boxes represent the largest and smallest observed scores that are less than 1.5 box lengths from the end of the box. In practice, these scores are about the lowest and highest values one is likely to observe.

As in any society, but in a special way in Brazil, the socio-economic status is a determinant of inequalities, which have an effect on school performance. For this reason it is impossible to understand the system without taking into account the students' socio-economic level. In the next section we introduce an indicator of socio-economic status.

The measurement of Socio-economic Status

There is no agreement on the best way to measure the socio-economic status in educational studies. On the one hand it is agreed that the index should include family wealth, parent's education and occupation status. On the other, it is not clear how these constructs should be dealt with. Besides, the necessary data is not easy to be collected in the educational context, where the questionnaires are usually answered by students who frequently do not know well details relating to their parent's lives. In this paper we use an SES measure, which incorporates the recommendations of Buchman (Buchmann 2002) and was developed by the same methodology used in PISA (OECD 2001).

To start with, four indicators of socio-economic and cultural positions were built i.e., social exclusion, parent's educational level, family wealth and home educational resources. Then these factors were combined, through factor analyses, in a single indicator.

The so called social exclusion factor was built taking into account the availability of running water, electricity and paved streets in the students' houses. The education factor is measured by the maximum number of school years of students' father and mother. The family wealth indicator was built based on three items: number of people per room in the house (assuming that richer families will have a smaller ratio); the existence of a housemaid, and the number of automobiles owned by the family. To measure the home educational resources, the following items were considered: calm place to study and access to daily newspapers, magazines, encyclopedias, atlases, dictionaries, calculator and Internet

Socio-economic Gradient

The socioeconomic gradient is defined as the best line that summarizes the relationship between the students' measure of socioeconomic status and their proficiency. See, for example, Chapter 2 of (Willms 2002).

In order to find this line, a plot with a point for every student is first constructed. The exact location of this is determined by both his/her socioeconomic index and proficiency. Figure 4 presents the socioeconomic gradient for the students tested in the SAEB 2001, in 8th grade mathematics.

The point, representing each student, is affected not only by the quality of the educational system they belong to, but also by social, economic and cultural factors. However it can be clearly observed that students from families with higher socioeconomic status have also higher proficiencies in average, while there are high variations about this general structure. Finally since the gradient is defined as a straight line, the marginal benefit of the socioeconomic advantage is the same in any point of the social position.

To increase the proficiency levels and lessen the effect of the socio-economic status in academic results should be the aim of any educational system. In simple words, the objective is to raise and level the learning bar. This is especially relevant in Brazil, where the relationship between education achievement and social position proficiency is so strong.

Figures 4 and 5 show the gradients for students classified by gender, color, school type and country region. It is clear from those plots that, over and above the differences in proficiency that can be associated to gender color, region, and system, improvement in performance is associated with higher inequality. This is shown by the steeper gradients for students who are males, whites, from southeast and from private schools. These educational inequalities appear in a recurrent manner in the various evaluation cycles, as demonstrated in many studies that analyzed the SAEB results (Alves and Soares 2002; Barbosa, Beltrao, Fariñas, Fernandes, and Santos 2001; Barbosa and Fernandes 2001; Soares, César, and Mambrini 2001) .

Figure 4: Relationship between student performance and social-economic background for the Brazilian students as a whole
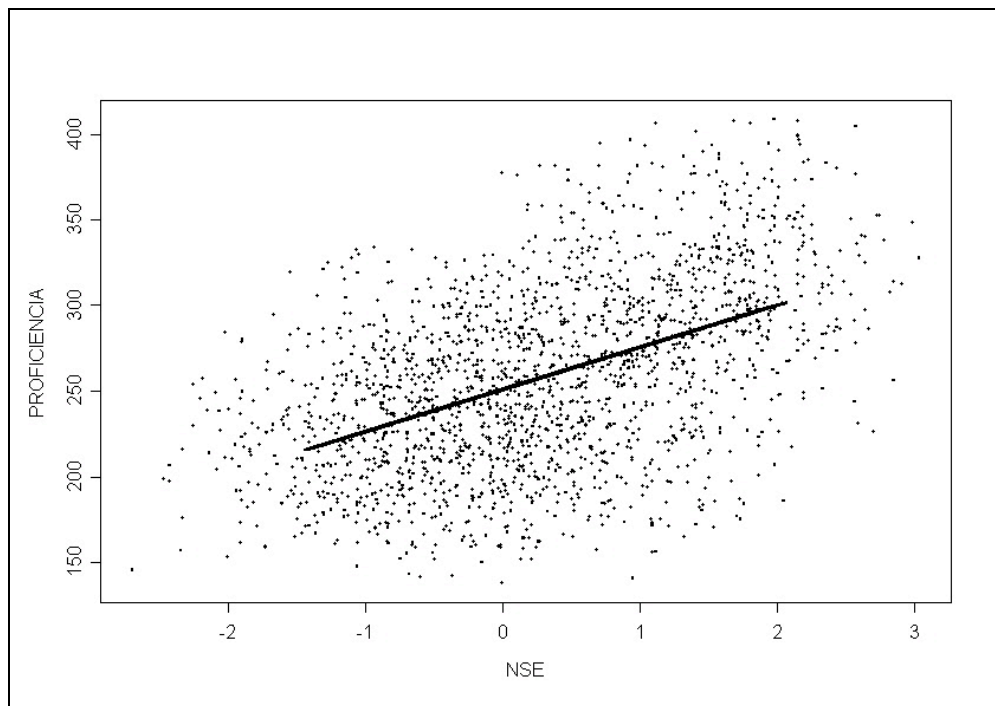

Figure 5: Relationship between student performance and social-economic background for the Brazilian students by school type
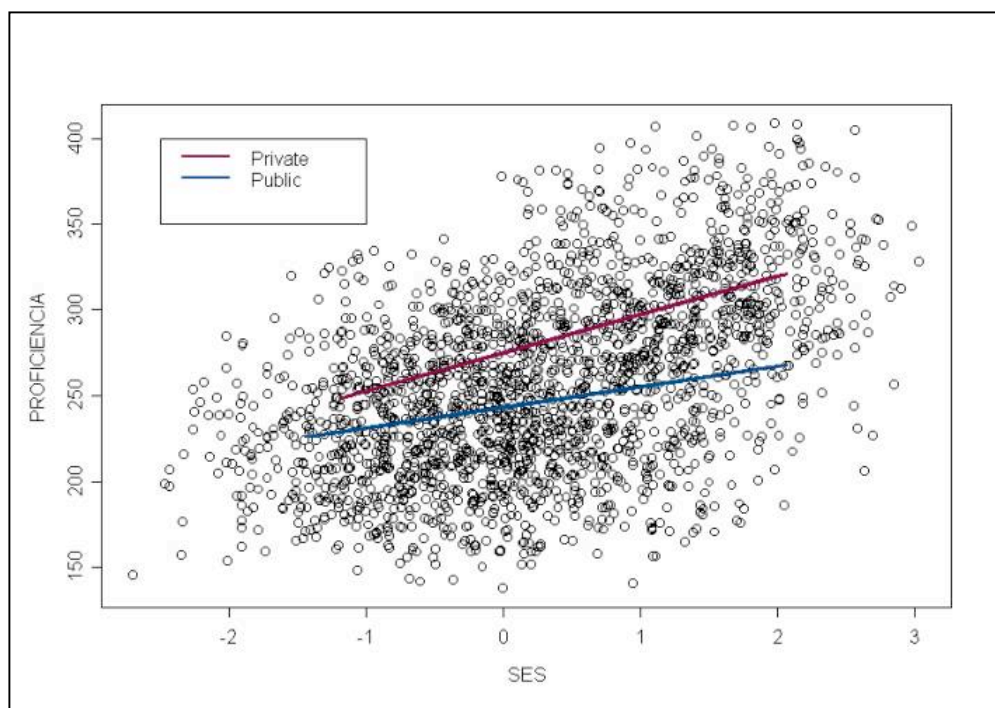
Figure 6: Relationship between student performance and social-economical background for the Brazilian students by region
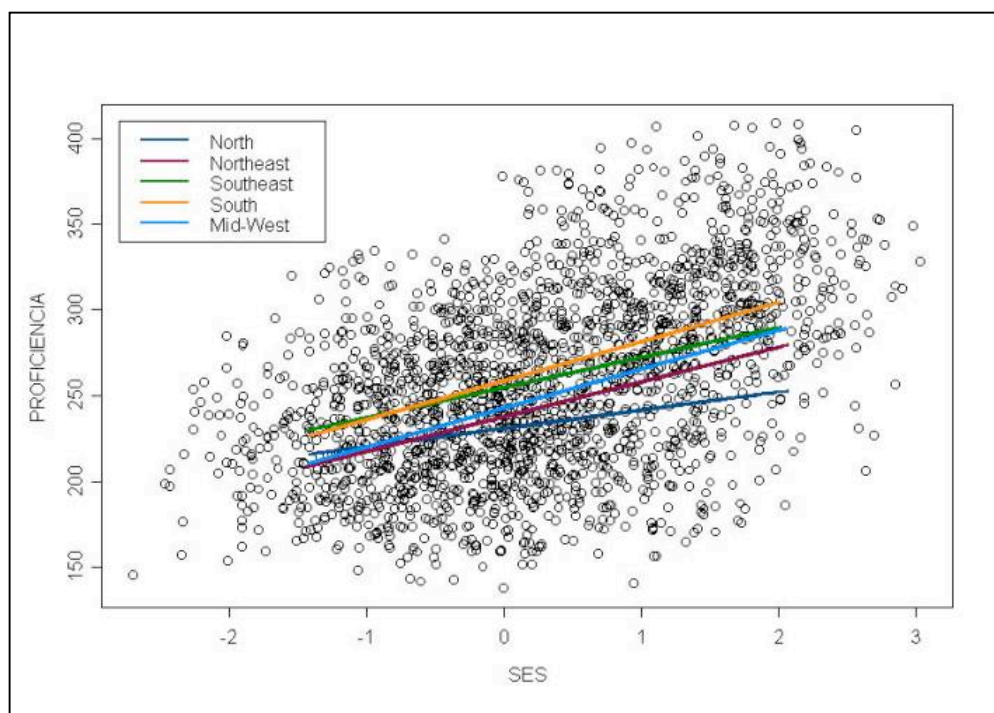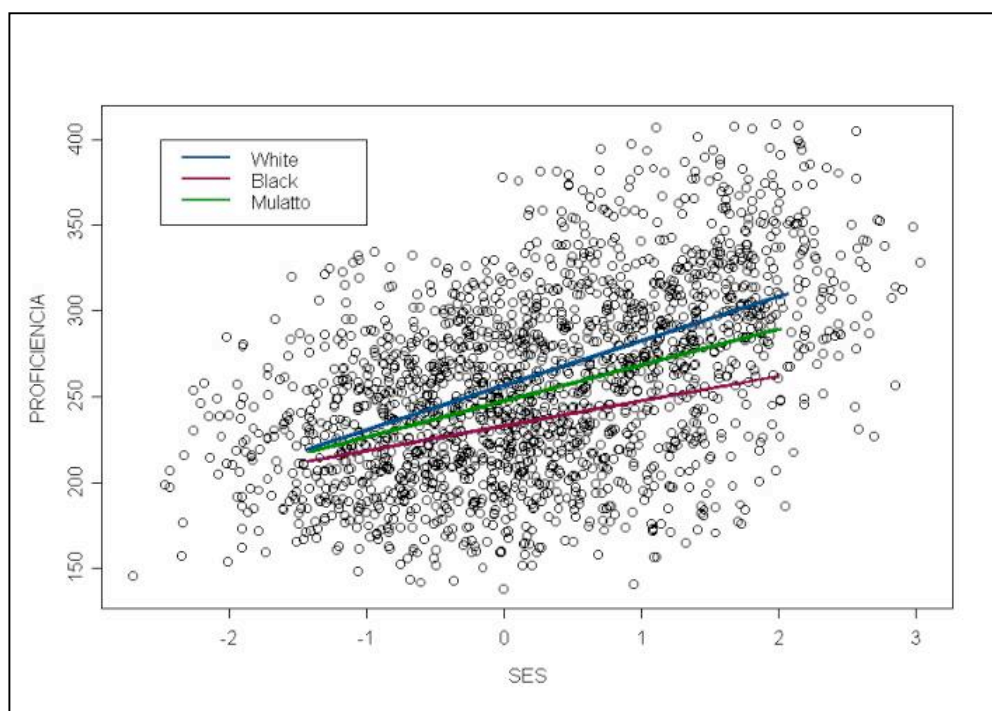

Figure 7: Relationship between student performance and social-economical background for the Brazilian students by race

These data plots show that education quality is not evenly distributed among the social classes and even worse, equity is observed only at very low levels of proficiency.

One of the basic theses of this paper is that both problems, i.e., quality and equity, should be approached concomitantly. In the next section, we examine the possible role of social, school and family elements to overcome these problems. International examples show that this can be accomplished. The recent PISA results show that Korea, Canada, Finland, Iceland and Japan present both a high degree of equality and quality in their educational systems. Particularly in Korea, the number of students with high academic performance, whose parents come from a low socio-economic and cultural background, is so high that the relationship between socio-economic position and academic performance is almost non-existent. The same phenomenon is observed in Cuba, as shown by the OREALC data. Yet, one question remains: Could Brazil had success in giving access to a good quality education without going through the present stage of inequality?

Improving Student Performance and Overcoming Inequalities

In this section we study, using the SAEB data, the impact of the three social dimensions: the student socio-economic status, cultural backgrounds of their families, and the school they attend on their cognitive performance.[4]

In order to do this we use a statistical model of two hierarchical levels; students being the level 1 and the school the level 2. For the level 1 model we have expressed each students' performance as a basal value modulated by influences, due to gender, color, socio-economic level and age-grade gap. For level 2 models we measured the impact of school characteristics (i.e. school type, its socio-economic level and the students' average age-grade gap level) on the basic students' performance level and on the extent of the effect of the model 1 level variables. For the technically minded, readers, the mathematical

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[4] A particularly appropriate class of statistical models has been used to investigate these educational topics. These models are called hierarchical regression models. Although they have a wide application scope, they are specially suitable for educational data analysis because of their clear hierarchical structure, i.e., a structure, which groups students into classrooms, classrooms into schools, and schools into educational systems or geographical regions. This statistical technique is very useful since it enables to identify the complex relationships existing between the factors at each level and how the various levels influence each other. (Bryk and Raudenbush 1992) and (Goldstein 1995) describe the technical details of these models.

expression of the models are presented in the appendix. There are several presentations of hierarchical models for social scientists audiences. A good example is (Lee 2000).

Following Willms' recommendations (Willms 2000), we have included among the schools characteristics the average of the students SES and age-grade gap as a proxy for the ability of the group of students of a given school. He justifies the use of these factors citing studies from several countries which show that schools or classrooms with students with high social-class or high ability intakes tend to have several advantages. On average these schools are more likely to have greater support from parents, fewer disciplinary problems, and a school climate oriented towards higher performance and they are more likely to attract and retain talented and motivated teachers. The literature uses the expression 'peer effects' to describe what occur in schools when bright and motivated students work together.

By including these school characteristics in our level 2 model, we neutralize statistically their effects when measuring the importance of other school processes. This procedure produces a very stringent test on the association of the factors with cognitive achievement, which, however, can be unfair to some schools (Bryk and Raudenbush 1992, p. 128).

The relationships among the multiple factors associated to cognitive performance are complex. Any intervention on social, school or family factors have in impact not only on students´ performance but on the other explanatory factors as well. For example, a change of policy coming from the State Secretariat for Education and backed by the schools can lead to more work satisfaction, higher teachers´ participation and changes in the whole chain of factors. Because of these complexities, we choose a conservative analysis. The models fitted to the data included all the control variables and only one educational process variable at a time. These models allow us to verify the existence of an impact due to a factor, but do not allow good measures of its effect, which, we feel, can not be obtained only with sectional data as produced by SAEB.

The results reported here should not be used for an automatic decision-making process. The expectation that we could look at the data to see which schools are performing below standard, then identify the variables causing low performance and finally prescribe a corresponding remedy, is what. Torgenson appropriately called "the positivist's dream," where knowledge replaces politics. (Torgenson 1986)

Social Policies

The students' socio-economic status is by far the factor with the biggest impact on their school results. It is a real, extra-school constraint which can help or hinder the learning process and that directly affects the functioning and organization of schools and classes. Therefore policies that reduce the disparities between the socio-economic and cultural background of the students of a given educational system have an impact on cognitive results, even if not immediately.

Table 5 shows our results describing the influence of social factors on the basic level of proficiency and on the increase or reduction of equity related to gender, color, SES and age-grade gap. The presence of a statistical significant association, which increases the quality or the inequity, is depicted in table 5 and in all other table by the symbol . If this association is only marginally significant we use the symbol r. Analogously if the factor is associated with a decrease in the quality or reduces inequity we use the symbols or s. When there is no association between the factor being considered and quality or equity we use the symbol -.

Table 5: Influence in the reference level and in performance inequalities due to gender, color, socio-economic position and age-grade gap related to social factors

Processes	Impact on the level of reference	Impact of equity due to:			
		Gender	Color	SES	Age- grade Gap
School type		-		-	-
School SES		-		-	
School type * School SES			-	-	-
Student SES					

The students social position as much as that of their school are strongly associated to the students' performance level. The influence of an individual's social position on his/her cognitive achievement has been recognized since the publication of the Coleman report (Coleman, Campbell, Robson, McPartland, and Mood 1966). However the influence of the

school SES, i.e. the average SES for all students of that school, must be specially highlighted.

Basic education in Brazil is very segmented. Most students with high socio-economic status attend private schools. Their highest privilege is that their schoolmates have the same academic motivations. The interaction between the school type and the average socio-economic background of the schools is significant and shows the special privilege enjoyed by those few Brazilians who attend private schools where the average socio-economic level is high. We must further observe that even after the stringent socio-economic equalization used here, the proficiencies of students from private is higher than that of students from state schools.

The last four columns of table 5 summarize the influence of these factors on equity. None of the factor considered reduces or increases the differences associated with the socio-economic status. Private schools and schools with higher SES reduce the gap between students of different colors. This is sad since most black students attend public schools where no similar effect is observed. The gender gap disappears on private schools that attend students with high SES. Finally schools with high SES increase the differences between students with high and low age-grade gap.

However, all these observations are of limited relevance to policy-makers and educational systems managers, given that socio-economic conditions are not affected on a short-term basis by educational policies.

School Policies

The aim of this section is to answer the following questions: What school policies and practices improve levels of schooling outcomes? And what school policies and practices reduce the inequalities presented before?

Before answering the specificity of these questions, it is useful to quantify the extent of the potential impact of all the school factors taken together. The hierarchical linear models can be used to do this, since they partition the variance in proficiency into the two components; the first associated with students and the second with schools. However, since the schools in Brazil are very much divided along socio-economic lines, we use the results of a model

that controls the proficiency by socio-economic variables. Again, for the more statistically sophisticated reader we present the model used in the appendix.

The important result to report is that, for 8th grade mathematics, the set of school factors can account only for 12.3% of the total proficiency variance. This value shows that the major part of performance variance must be attributed to intrinsic variations among students that are not associated to socio-economic differences or to socio-economic differences among students from different schools, bearing in mind that these have been controlled in the model. However, the remaining value, which is compatible with international literature on the subject, is high enough for us to recognize that there is a variation between schools that cannot be attributed to social factors only, or to random fluctuations. It means that we can assert, beyond the reasonable dough, that the schools, by themselves, make a difference in students' lives and therefore that their influence must therefore be optimized through school policies and practices.

Table 6 presents a summary of the effects of the teachers' characteristics that affect proficiency and the gaps associated to gender, race, SES and age-grade.

Table 6: Effect of the processes associated to the teachers' on cognitive performance and on to the gaps related to gender, SES and age-grade gap.

Teacher Processes	Impact on the level of reference	Impact in equity due to:			
Gender Color SES Age-grade gap		Gender	Color	SES	Age-grade gap
Degree in Mathematics		-		-	-
Teachers' expectations		-	-	-	-
Content already developed		-	-	-	-
Tradicional Pedagogical option		-	-	-	-
Relationship with the principal		-	-	-	-
Relationship with the team		-		-	-
Perception of School external problems	r	-	-	s	-
Perception of School internal problems		-	-	-	
Commitment	-	s	-	-	r
Dedication	-	-	-		-
Salary		-	r	-	-
Gender	s	-	-	-	-

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Firstly, it should be noticed that not all factors associated to the teachers and listed in the school effectiveness literature are included. The reason being that the SAEB data is collected through a questionnaire answered by the teachers of the tested subjects on the day in which the test is being given. Therefore, many factors cannot be assessed. For a review of the teacher characteristics and attitudes associated to a better performance see (Darling-Hammond 1999). However, since it is reasonable to assume that there is association between the measured and not-measured factors, the table constructed with the collected data is not biased.

Few factors have an impact on equity. A possible explanation is that today to overcome inequalities is not a problem stressed in the school routine and thus it is not a concern for the teacher. This hinders the presence of successful experiences that would be registered in the data and capture in our analysis.

The influence of school processes presented in Table 7 is similar to that associated to teachers' characteristics. Each of the school factors included was measured by the questionnaire answered by the director, and by the school conditions questionnaire. Important characteristics such as school climate could not be measured since only the teachers of the evaluated classes answered the questionnaire. For a more complete description of school factors see (Lee, Brik, and Smith 1993; Sammons, Hillman, and Mortimore 1995)

Table 7: Effect of the processes associated to the school in the cognitive performance and to the difference related to gender, SES and age-grade gap

School Processes	Secondary Level effect	Impact in equity due to:			
		Gender	Color	Ses	Age-grade gap
Equipments		-		-	-
Safety		-	r	s	
School maintenance: (cleanness)		-	r	-	-
School maintenance: (classes)		-		-	-
School maintenance: Building		-	-	-	-
Pupil selection		-	-	-	-
Principal vision on teachers' commitment		-	-	-	-
Perception of School external problems		-	-	s	-
Perception of School internal problems	-	-	-	-	
Principal with Post-Graduated Degree	-	-	-	-	s

The School of the disadvantaged

In order to have a more general view of these schools and teachers' factors we combined the positive characteristics identified in the last two sections in two factors that synthesize teacher and school efficiency. The method of aggregation used was the simplest one. We just counted the number of positive characteristics. Table 8 shows the average of these two factors for sub-groups of the students identified by the variables, gender, skin color, socio-economic background and age-grade gap, the same factors that generated the differences presented in section 3.

Table 8: Average number of positive characteristics associated with teachers and schools in the sub-groups generated by the variables, sex, skin color, SES and age-grade gap

	Teacher factor	School factor	Student factor
Gender			
Male	3.61	1.45	2.45
Female	3.59	1.40	2.59
Skin color			
White and Yellow	3.82	1.66	2.64
Others	3.37	1.17	2.39
SES			
Low	3.95	1.90	2.95
High	3.35	1.05	2.19
Age-Grade gap			
Yes	3.91	1.72	2.77
No	3.25	1.10	2.25

The quality of the teachers and the school that enroll boys and girls is the same. Therefore the difference in performance between boys and girls cannot be attributed to the different characteristics of the school they attend. However for skin color, SES and age-grade gap, it can be said that students who have a weaker performance are also those with lower values in the teacher and school factors. In other words, the school of the students with the worst performance is also worse than the school of the students with the best performance. Then the most obvious policy in order to overcome these differences is to allocate the best teachers and schools to non-white students with low socio-economic background and bigger age-grade gap. This study does not intend to discuss the viability of such proposal. We show in next sections that this policy alone would not eradicate the differences mentioned.

Family Contribution

The family stimulates the student either through the transmission of cultural wealth or the fomentation of study habits or through motivation and continuity of educational prospects. Table 9 presents the results of the family factor for which SAEB have data.

Table 9: Influence in the reference level and in performance discrepancies due to gender, color, and socio-economic position and age-grade gap related to student and family factors

Student Processes	Impact on the level of reference	Impact of equity due to:			
		Gender	Color	SES	Age-Grade Gap
Like to study		-			
Book		-			
Homework		s		-	
Reading Habits		-	-		
Parent's Involvement	Ä	-	-	-	-

This set of factors is the one with more clear effects both in the level of performance and on reducing the proficiency gap due to gender, color, SES and age- grade gap. While they are more associated with student attitudes and family practices, their significance show that every school should try hard to involve the parents in the education of their children by reading to them, supervises their homework and developing their motivation for studying.

Conclusion

Policy recommendations should be backed by solid evidence. The evidence presented here is not definitive, since it was obtained through data analyses based only on the results from 8th grade SAEB 2001 Mathematics test. Stronger evidences would be obtained with similar analysis based on the other grades results as well as the other subjects and cycles of the SAEB. In addition it should be emphasized that SAEB sample design is not the most appropriate to analyze the effect of social and school factors on achievement. Longitudinal designs would be more adequate and experiment designs the gold standard. For a very clear presentation of the limitation of educational surveys like SAEB, one could read (Podgursky 2001) .

SAEB not only generates information about the quality of Brazilian Primary Schools, but also provides very useful information on how to improve them. The analyses presented in this paper along with others, show that the determinants of quality in Brazilian Primary Schools are very similar to that of other countries. Therefore all international literature in the area is relevant to Brazilian basic education system. Since Brazilian education is often too much self-centered, the importance of this simple finding must not be minimized.

The transformation of all the results presented in this paper into educational policies requires studies different from the one presented here. This will be done, eventually. Nevertheless, it must be clear that policies to change the despairing scenario of primary education in Brazil would require the participation of all the sectors involved. The solution will not come only on governmental policies imposed on schools, as some people believe. It will be a slow transformation based on small victories. However just as access to education was obtained, quality can also be reached with time.

References

Alves, M. T. and José Francisco Soares. 2002. "Raça e desempenho escolar: as evidências do Sistema de Avaliação da Educação Básica - SAEB." in *XXVI Encontro da Associação de Pós-Graduação em Ciências Sociais - ANPOCS*. Caxambu, Minas Gerais.

Andrade, D., P.L.N. Silva, and W. O. Bussab. 2001. "Memorando técnico: o plano amostral do SAEB 2001."

Barbosa, M. E. F., Kaizo Iwakami Beltrao, M . N. Fariñas, C. Fernandes, and D. Santos. 2001. "Modelagem do Saeb - 99". Relatório Técnico." ENCE-IBGE.

Barbosa, Maria Ligia de Oliveira and C. Fernandes. 2001. "A escola brasileira faz diferença? Uma investigação dos efeitos da escola na proficiência em Matemática dos alunos da 4a série." Pp. 155-172 in *Promoção, ciclos e avaliação educacional*, edited by C. Franco. Porto Alegre: Artmed.

Bonamino, A. M. C. 2002. *Tempos de avaliação educacional; O SAEB, seus agentes, referências e tendências*. Rio de Janeiro: Quartet Editora & Comunicação Ltda.

Bryk, Anthony S. and Stephen W. Raudenbush. 1992. *Hierarchical linear models : applications and data analysis methods*. Newbury Park: Sage Publications.

Buchmann, C. 2002. "Measuring family background in international studies of education: conceptual issues and methodological challenges." Pp. 150-197 in *Methodological advances in cross-national surveys of educational achievement*, edited by A. C. Porter and G. A. Washington, D.C.: National Academic Press.

Castro, Maria Helena Guimarães de. 1999. *Education for the 21st century : the challenge of quality and equity*. Brasília: MEC Instituto Nacional de Estudos e Pesquisas Educacionais INEP.

Coleman, James Samuel, Ernest Q. Campbell, Carl F. Robson, James McPartland, and Alexander McFarlane Mood. 1966. *Equality of educational opportunity*. Washington, D.C.: Department of Education.

Crespo, Manuel, José Francisco Soares, and Alberto Mello e Souza. 2000. "The Brazilian national evaluation system of basic education: context, process, and impact." *Studies in Educational Evaluation* 26:105-25.

Darling-Hammond, Linda. 1999. *Teacher quality and student achievement : a review of state policy evidence*. Seattle, WA: Center for the Study of Teaching and Policy University of Washington. http://depts.washington.edu/ctpmail/PDFs/LDH%5F1999.pdf

Franco, Creso. 2001. "O SAEB: potencialidades, problemas e desafios." *Revista Brasileira de Educação* 17:127-32.

Goldstein, Harvey. 1995. *Multilevel statistical models*. London; New York: E. Arnold; Halsted Press.

Klein, Ruben and N. S. Fontanive. 1995. "Avaliação em larga escala: uma proposta inovadora." *Em Aberto*:29-35.

Lee, V. E. 2000. "Using hierarchical linear modeling to study social contexts: the case of school effects." *Educational Psychologist* 35:125-141.

Lee, V. E., A. S Brik, and J. Smith. 1993. "The Organization of Effective Secondary Schools." Pp. 171-276 in *Review of research in education*, edited by J. A. Banks and L. Darling-Hammond. Washington, D.C.: American Educational Research Association.

Locatelli, I. 2002. "Construção de instrumentos para a avaliação em larga escala e indicadores de rendimento: o modelo do SAEB." *Estudos de Avaliação Educacional* 25:3-21.

OECD. 2001. "Knowledge and skills for life - first results from PISA 2000 - Education and skills." Paris: OECD Programme for International Student Assessment,.

Podgursky, Michael. 2001. "Flunking ETS." *Education NExt* Summer:75-78. http://www.educationnext.org/20012/75.html

Sammons, Pam, Josh Hillman, and Peter Mortimore. 1995. *Key characteristics of effective schools : a review of school effectiveness research*. London: Great Britain Office for Standards in Education; Institute of Education University of London.

Soares, José Francisco, C. C. César, and J. Mambrini. 2001. "Determinantes de desempenho dos alunos do ensino básico brasileiro: evidências do SAEB de 1997." in *Avaliação, ciclos e promoção na educacão*, edited by C. Franco. Porto Alegre: Artmed.

Torgenson. 1986. "Between knowledge and politics: Three faces of policy analysis." *Policy Sciences* 19:33-59.

Willms, Jon Douglas. 2000. "Monitoring School Performance for 'Standards-based Reform." *Evaluation in Education* 14:237-253.

—. 2002. *Vulnerable children*. Edmonton, CA: University of Alberta Press.

Appendix - Variables used in the analysis.

SAEB uses five different instruments to collect the data: the test and four different questionnaires answered by the student the teacher, the school principal and a school questionnaire filled by the person in charge to supervise the application of the test in the school. Below we describe how the different factors present in tables 5, 6 and 7 have been defined.

Student and Family Factors

1. **Likes to study**: Indicator variable which capture whether the student likes or not mathematics. 0 – Do not like 1 – The student likes to study.
2. **Books at home**: Indicator variable 0 – less than 20 books 1 – more than 20. The schools books are not included in the count.
3. **Homework**: Indicator variable 0 – the student usually do not complete the homework 1- the student complete the homework
4. **Reading Habits**: Cartoons, novels, newspapers and information magazines.
5. **Parent's Involvement**: Scale constructed with several items included in the student questionnaires, which asked whether their parents spend time with them on: talking, having meals, supervising homework etc.
6. **Student SES**: explained in the paper.

Teacher Factors

1. **Degree in mathematics**: whether the teacher has a teacher certification in Mathematics.
2. **Teachers' expectations**: on the future success on his or her students.
3. **Content already developed**: percentage
4. **Traditional pedagogical option**: Teaching based on memorization and repetitions.
5. **Relationship with the Principal**: Several items which measure how much the teacher values the principal as a pedagogical and administrative leadership.
6. **Relationship with the team: S**everal items which describe how well the teacher feels for belonging to the teaching staff of that school.
7. **Perception of school's external problems**: Teacher perception about the existence of the following school problems: lack of teacher for some disciplines, too many extra-activities during the class time, teachers absence, students' truancy, theft and violence, and disciplinary problems.
8. **Perception of school's internal problems**: The teacher perceives that the school has financial problems and lack of administrative staff, pedagogical staff and pedagogical materials
9. **Commitment**: items that capture how many teachers in the school feel responsible for the pedagogical projects.

10. **Dedication**: teacher has another activity beside teaching.
11. **Salary**
12. **Gender**

School Factors

1. **School type**: Indicator variable. 0 – public school 1- private school.
2. **School SES**: Average of all its student's SES.
3. **Equipment**: Number of the following items present in the school building: tv, video, copy machines, overhead projector, typing , printer and audio system.
4. **Safety**: existence of safety items as: policy, walls, entry and living control and graffiti
5. **School maintenance (cleanness):** teaching rooms, bathrooms, recreation areas and external areas.
6. **School maintenance (classes):** light, ventilation, and external noise.
7. **School maintenance (building)**: electrical, hydraulic, bathrooms, etc..
8. **Pupil selection**: whether there is selection of student admission.
9. **Principal's vision on teachers' commitment**: how the Principal sees the teachers commitment**.**
10. **Perception of School's external problems** how the Principal sees the existence of external problems.
11. **Perception of School's internal problems**: how the Principal sees the existence of internal problems.
12. **Principal with Post-Graduate Degree**

Mathematical Models

Mathematical expression of the basic model:

```
Level-1 Model

      Y = B0 + B1*(GENDER) + B2*(COLOR) + B3*(SES) + B4*(AGE-GRADE GAP) + R

Level-2 Model

      B0 = G00 + G01*(SCHOOL TYPE) + G02*(MEAN SES) + G03*(MEAN AGE-GRADE GAP) +
G04*(SCHOOL TYPE * MEAN SES) + U0
      B1 = G10
      B2 = G20
      B3 = G30
      B4 = G40
```

Mathematical expression for model which verifies whether the existence of school selection impacts the proficiency

```
Level-1 Model

      Y = B0 + B1*(GENDER) + B2*(COLOR) + B3*(SES) + B4*(AGE-GRADE GAP) + R

Level-2 Model

      B0 = G00 + G01*(SCHOOL TYPE) + G02*(MEAN SES) + G03*(MEAN AGE-GRADE GAP) +
G04*(SELECTION) + G05*(SCHOOL TYPE * MEAN SES) + U0
      B1 = G10
      B2 = G20
      B3 = G30
      B4 = G40
```

Mathematical expression for model which verifies whether the existence of school selection impacts the equity

```
Level-1 Model

      Y = B0 + B1*(GENDER) + B2*(COLOR) + B3*(SES) + B4*(AGE-GRADE GAP) + R

Level-2 Model

      B0 = G00 + G01*(SCHOOL TYPE) + G02*(MEAN SES) + G03*(MEAN AGE-GRADE GAP) +
G04*(SELECTION) + G05*(SCHOOL TYPE * MEAN SES) + U0

      B1 = G10 + G11*(SCHOOL TYPE) + G12*(MEAN SES) + G13*(SELECTION) +
G14*(SCHOOL TYPE * MEAN SES) + U1
      B2 = G20
      B3 = G30
      B4 = G40
```