

What difference do schools make? A mixed methods study in secondary schools in Peru

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114

Documentos de Investigación 114

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Electronic publication. First edition. Lima, May 2021

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The opinions and recommendations provided in this document are those of the authors, and do not necessarily represent the points of view of GRADE, nor of its sponsoring institutions. The authors disclose no conflicts of interest related to the present study, its results, or interpretations of them. This research has been funded by the Global Challenges Research Fund (GCRF), administered through the Economic and Social Research Council (ESRC). Additional support has been provided by the Old Dart Foundation (ODF).

Research director: María Balarin
Assisting editor: Diana Balcázar Tafur
Cover design: Elena González
Design of layout: Amaurí Valls M.

A catalog record of this report is available from the National Library of Peru (Legal deposit No. 202104687)
Hecho el Depósito Legal en la Biblioteca Nacional del Perú N° 202104687
ISBN: 978-612-4374-39-5

CENDOC / GRADE

LEÓN, Juan; Gabriela GUERRERO, Santiago CUETO & Paul GLEWWE
What difference do schools make? A mixed methods study in secondary schools in Peru / Juan León, Gabriela Guerrero, Santiago Cueto and Paul Glewwe.
Lima: GRADE, 2021. (Documentos de Investigación, 114).

SECONDARY EDUCATION, SECONDARY SCHOOLS, ACADEMIC ACHIEVEMENT, PERU

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ABSTRACT

This study contributes to filling the existing gap in the scarce literature on school effectiveness in secondary education in Peru by addressing the following questions: i) which educational processes within schools are most influential in math and reading comprehension? and in the case of the most effective schools, ii) what is the importance that principals, teachers, and students place on school processes variables in explaining educational outcomes? We use a mixed-method design that follows a sequential explanatory design. First, using the Young Lives secondary school survey in Peru (2017), we estimate a random effects model to explore the effect of teacher and school level variables on math and reading comprehension. Then, we conduct a qualitative case study in two schools identified as high-performance schools (HPS) by the survey, with the aim of explaining the role of school processes variables on educational results. The multivariate analysis shows that among teacher and classroom level variables, feedback provided to students and the satisfaction with his/her relationship with the educational actors were statistically significant. Among school level variables, school principal's experience, average level of school wealth index, students per classroom and the infrastructure were statistically significant. The analysis of in-depth interviews and focus groups with vice-principals, teachers, and students from the two HPS shows that these two effective schools promote higher student achievement through different policies. At the school level, they have monitor-

ing and constant teacher training policies to improve the quality of teaching. They also have student discipline and teacher collaboration policies to promote a conducive school learning environment. Correspondingly, at the classroom level, these schools are characterized by the quality of their teaching strategies regarding peer-mentoring, feedback and use of materials, and by their positive classroom learning environments based on teachers' monitoring of students' progress and teacher-student relations of care and trust. Our results point out the importance of the pedagogical work of the different educational actors inside the school. Educational programs carried out by local and national governments should pay more attention to the dynamics within the school to mitigate the educational inequalities, equalizing upwards the opportunities for children in impoverished public schools.

RESUMEN

Este estudio contribuye a llenar el vacío existente en la escasa literatura sobre eficacia escolar en educación secundaria en el Perú al abordar las siguientes preguntas: i) ¿qué procesos educativos dentro de las instituciones educativas son más influyentes en matemáticas y comprensión lectora? Y en el caso de las instituciones educativas eficaces, ii) ¿cuál es la importancia que los directores, docentes y estudiantes asignan a las variables de procesos escolares para explicar los resultados educativos?

Para responder a estas preguntas de investigación, utilizamos un diseño de método mixto que sigue un diseño explicativo secuencial. Primero, usando la encuesta escolar de secundaria de Niños del Milenio en el Perú (2017), estimamos un modelo de efectos aleatorios para calcular el efecto de cada variable del docente y de la institución educativa en el rendimiento de los estudiantes en matemáticas y lectura. Luego, realizamos un estudio de caso cualitativo en dos instituciones educativas identificadas como de alto rendimiento (en contextos de pobreza) por la encuesta escolar, con el objetivo de explicar con más detalle el papel de las variables de procesos escolares en los resultados educativos.

El análisis multivariado muestra que, entre las variables del docente y del aula, la retroalimentación brindada a los estudiantes y la satisfacción en su relación con los actores educativos fueron estadísticamente significativas. Asimismo, entre las variables a nivel de la institución educativa, la experiencia del director de la escuela, el índice de riqueza escolar promedio, los estudiantes por aula y la infraestructura tienen

un efecto para explicar los puntajes de los estudiantes en matemática y lectura. El análisis de las entrevistas en profundidad y grupos focales con subdirectores, maestros y estudiantes de las dos instituciones educativas eficaces muestra que ambos colegios secundarios promueven un mayor rendimiento estudiantil a través de una serie de políticas. A nivel de la institución educativa, ambos colegios cuentan con políticas de formación continua y acompañamiento pedagógico orientadas a mejorar la calidad de la enseñanza. También tienen políticas de disciplina estudiantil y colaboración entre docentes para promover un ambiente propicio para el aprendizaje escolar. Estas políticas, a su vez, se traducen en prácticas en el aula. Las instituciones educativas se caracterizan por la calidad de sus estrategias de enseñanza en relación con la tutoría entre pares, la retroalimentación y el uso de materiales, y por sus entornos positivos de aprendizaje en el aula basados en el seguimiento, por parte de los docentes, del progreso de los estudiantes y las relaciones docente-alumno de cuidado y confianza.

Los resultados señalan la importancia del trabajo pedagógico de los diferentes actores educativos dentro de la escuela. Por lo tanto, los programas educativos que llevan a cabo los gobiernos locales y nacionales deben prestar atención a las dinámicas dentro de las escuelas para mitigar las desigualdades educativas, con el fin de equiparar hacia arriba las oportunidades de los y las estudiantes en las escuelas públicas en contextos desfavorecidos.

INTRODUCTION

As access to schooling around the world has rapidly increased, schools are now expected to promote high learning levels among students, which would enable them to perform as active citizens and productive workers. However, many national and international evaluations show that there are large differences between countries, with those that have lower levels of poverty showing higher performance (OECD 2019a; MINEDU 2019; Mullis, Martin, Foy & Hooper 2015; Flotts et al. 2015). Furthermore, within developing countries there is often a large difference in learning outcomes between students, associated with, among other variables, poverty and ethnicity (Flotts et al. 2015; Duarte, Bos & Moreno 2010). However, in these countries it is often observed that some schools that work with indigenous students or in contexts of high poverty, or both, show a higher-than-expected performance, pointing-out the existence of effective schools.

The literature on school effectiveness is scarce in Peru and other developing countries and most existing studies explore this issue at primary level, only few investigate the secondary level. In Peru, we know of no study that explores what makes a secondary school effective or investigates in depth what educational processes variables play a key role in promoting students' good educational results despite the poor context where they live. Thus, this study contributes to filling the existing gap about school effectiveness at secondary level in developing countries. We take advantage of a data set of secondary schools

and students in Peru, a country where high levels of inequality are often observed (Cueto, Miranda, León & Vásquez 2016), to perform a mixed methods study. In the first part of the analysis, we use statistical methods to estimate which schools are performing above what would be expected from them, given their high concentration of students from low socioeconomic status and indigenous students (i.e., mother tongue is indigenous), who have historically been disadvantaged in Peru. In the second part, we present the results of a qualitative study carried out in two public schools identified in the first analysis as having students with an academic performance above what would be expected given their backgrounds. As in many other developing countries, Peru has achieved high levels of coverage and at the same time low levels of achievement among its students and large gaps between students from higher and lower SES; also, indigenous students consistently achieve below Spanish-speaking students in standardized tests (Guadalupe, León, Rodríguez & Vargas 2017; Cueto, Miranda, León & Vásquez 2016; Guadalupe, León & Cueto 2013).

Literature review

School effectiveness research originally arose in the United States as a reaction to the findings of the well-known Coleman report (Coleman et al. 1966), and following studies such as Bernstein (1970) and Jencks et al. (1972), which concluded that schools had little effect upon the outcomes of their students in comparison with the effects of students' own ability and social backgrounds. These conclusions were so disturbing to many educators and educational researchers that responding studies began to appear almost immediately (Edmonds 1979; Mortimore et al. 1988; Reynolds 1976; Rutter et al. 1979; Smith &

Tomlinson 1989; Weber 1971). Each of these studies found consistent school effects on students' outcomes; thereafter, the field has experienced sustained growth and internationalization, fostered by the synergies resulting from school effectiveness researchers working closely with school improvement researchers and practitioners (Reynolds et al. 2014), as they share a common practical goal: enhancing the quality of schooling, particularly for disadvantaged students (Scheerens 2015). Thus, school effectiveness research has sought to explain why some schools are more effective, regardless of social context; so, the focus has been on the study of school characteristics that accounted for an "*effective school*", defined as a school in which the progress of the majority of students was greater than expected, given their families' socioeconomic conditions (Mortimore 1998). As a result, different studies have concluded that schools do influence student outcomes (Seidel & Shavelson 2007) through sets of variables that operate at multiple levels (Teddle & Reynolds 2000).

However, one of the most important criticisms of school effectiveness research is the lack of analytical models from which to build theory (Kyriakides 2005). A large international review of 109 school effectiveness research studies concluded that only 6 could be seen as theory driven. Consequently, most of these studies are concerned with the establishment of a statistical relationships between variables, rather than with the generation and testing of theories that could explain those relationships (Creemers 2006; Scheerens 2013).

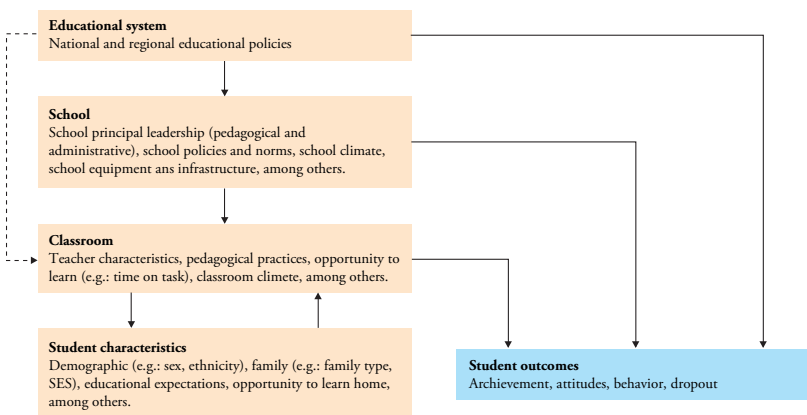
The model we use is an adaptation of Creemers & Kyriakides (2008). Explaining in an integrated theoretical fashion the associations between variables has been the focus of this dynamic model of school effectiveness. The model is comprehensive in nature and looks simultaneously at the different levels of the educational system: the student, the classroom, the school, and the context-system; and all these factors are

seen as having both direct and indirect effects upon students' outcomes (Reynolds et al. 2014). Departing from an extensive literature review of the educational effectiveness research, the authors consider that the main function of a school is learning (Creemers & Kyriakides 2008, p. 137) and that the classroom-level factors, especially teaching practices, have more significant impacts on students' outcomes than the factors at the school and the system levels (Creemers & Kyriakides 2008, p. 120). Thus, *teaching and learning* are at the core of the dynamic model and the roles of teachers and students are carefully analyzed. Above these two levels, school-level factors influence the teaching/learning situation by developing and evaluating school policy on teaching practices in the classroom and on the classroom's learning environment. The system level refers to the development and evaluation of educational policies at the national or regional level that impact on the schools' policies for teaching and on the schools' learning environment (Creemers & Kyriakides 2008, p. 138). It also is taken into account that the teaching and learning situation is influenced by the wider social context in which students, teachers, and schools are expected to interact. Factors such as the values placed by society on learning and the importance attached to education play an important role both in shaping teacher and student expectations (Creemers & Kyriakides 2016).

The dynamic model identifies two main categories of background factors at the student level that can influence students' achievement: 1) socio-cultural and economic variables, mainly socio-economic status (SES), ethnicity, and gender; and 2) psychological variables such as aptitude, motivation, expectations, personality, and thinking style. Regarding the classroom level, the authors identified 8 factors concerning teacher behavior in the classroom: orientation, structuring, questioning technique, teaching-modelling, applications, teacher role in making classroom a learning environment, management of time, and classroom

assessment. Meanwhile, school factors are expected to influence classroom-level factors, especially teaching practices; thus, emphasis is given to two aspects of school policy: 1) policies related with teaching and its evaluation, and 2) policies related with creating a learning environment and its evaluation. Finally, the dynamic model takes into account context-system factors that refer to aspects of the national policy that affect learning inside and outside the classroom; specifically, these factors refer to the national educational policy related to teaching practices and the learning environment of the school, and the mechanisms established to assess the adequacy of the policy (Creemers & Kyriakides 2008). The following figure is adapted from the dynamic model stated by Creemers & Kyriakides; nevertheless, one criticism to this model is that it focuses mainly on processes variables. In this adaptation, we do not leave out inputs variables because previous studies for Latin American countries suggest the importance of these variables given the high levels of inequalities in our educational systems.

Figure 1
School effectiveness model



Adapted from Creemers and Kyriakides (2008).

School effectiveness research in Latin America

School effectiveness research in Latin America has been limited, although there have been some studies in the last decade which have analyzed effective schools, their distinguishing factors, and the contexts that explain their outcomes. Based on the dynamic model framework, the main findings of these studies focus on the factors above the student level, and may be summarized as follows. First, at the *classroom level*, several teaching practices are highlighted as important factors influencing school effectiveness in Latin American countries. For Chile, Bellei, Muñoz, Pérez & Raczynski (2003) and Concha (2006), identified nine effective teaching practices: 1) Orientation towards and focus on what is proposed by the curriculum. 2) Teachers' intention to help the student make knowledge their own. 3) Highly structured lessons by the teachers. 4) Teachers' capability to adapt methodologies and resources to the different interests, rhythms and styles of the students. 5) Constant supervision and feedback to students. 6) Intensive use of time to teach. 7) High sense of rigor and expectations from teachers towards their students. 8) Teacher-student relationships marked by affection and trust. 9) Didactic materials provided are used appropriately.

In Venezuela, López (2006) found four effective teaching practices: 1) teachers had high expectations of their students. 2) Intensive use of time to teaching. 3) Special work was done with low-achieving students. 4) The teacher-students relationship was respectful and full of affection. For the Dominican Republic, Figueroa and Montes de Oca (2015) underscored two teaching practices: 1) distancing from traditional learning techniques such as memorization, improved use of notebooks encouraging individual practice of tasks and exercises; and 2) greater frequency of written evaluations. Besides, the Ministry

of Education of Argentina (2018) highlighted two crucial teaching practices: 1) capability to adapt the curriculum content to the particular needs of the students. 2) Teachers expected high achievements from their students and made efforts to monitor them permanently.

Finally, the multi-country analysis of Murillo (2007) generalized some results on this topic to Latin America, highlighting five teaching practices: 1) attitude of the teacher to the use of punishments; 2) teaching methodology, preparation of sessions, their structure, focus on basic skills, attention to diversity, and the use of traditional or technological resources; 3) frequency of evaluation and communication of results; 4) intense use of time for teaching; and 5) teacher's commitment to its students. This study also underlined factors concerning the classroom ecology (number of students per teacher) and climate (good and affective relationships between teachers and students).

Second, at the *school level*, the attention has been centered on different features of the schools' leadership, policies and organization. For the Chilean case, 13 factors of the school leadership, policy and organization can be identified from the studies of Bellei, Muñoz, Pérez & Raczynski (2003) and Concha (2006): 1) great sense of identity and work ethic of the educational actors regarding the institution. 2) Clear and concrete objectives and strategies focused on learning. 3) Principals and teachers perceived by the school community as valuable authorities. 4) Teaching autonomy. 5) Coordination among administrative staff and teachers to plan the results of the courses. 6) Pedagogical strategies adapted to the different requirements of all students. 7) School curriculum with reviewed, adapted and contextualized contents. 8) Clear rules and management of discipline. 9) Adequate working conditions to teachers, managing their academic demands and facilitating their professional development. 10) Seeking of external support and efficient use of material resources. 11)

The patron (individual or institution that acts as intermediary of the Chilean State) of these schools gave principals and teachers autonomy to handle the management and pedagogy of the school. 12) High involvement of the parents in the educational process. 13) Developed indicators for monitoring and evaluation.

In Venezuela, López (2006) centered on the following characteristics of the school leadership, policies and organization: 1) constant training of teachers. 2) Coordination and collective work among staff. 3) Planning autonomy. 4) Clear and concrete objectives. 5) High participation of the teachers in the decision-making process led by the administrative staff. 6) Mutual assessment between the different actors involved in the educational process. While for the Dominican Republic, Figueroa and Montes de Oca (2017) underlined 1) good communication between educational actors, 2) clear goals, and 3) large investment of time in management activities and academic affairs by principals. Moreover, the Ministry of Education of Argentina (2018) highlighted that school leadership, policies and organization featured: 1) principals committed to make the institution visible and reaffirm their achievement; which they encouraged 2) establishing a space for dialogue and mutual recognition, between teachers, principals and teachers, and among students, under a framework of openness to the community.

From a multi-country perspective, Murillo (2007) identified the following features of school leadership, policies and organization: 1) clear objectives stated in the school's mission; 2) commitment to the formation of students, focused on learning; 3) teachers cooperation and teamwork; 4) commitment of the school principals, their technical capacity and management experience, and their tuition status; 5) high expectations towards the teachers, the administration and the students; 6) professional opportunities and continuous training for

the teachers; 7) involvement of families in the activities and decision-making processes of the school.

At the school level, the literature on school effectiveness in Latin America also emphasizes the importance of factors concerning school ecology. In Chile, Concha (2006) found that effective schools were characterized by having on average classrooms with 25 students or less; in Venezuela, López (2006) established that effective schools had clean material resources in perfect conditions; and later Figueroa and Montes de Oca (2017) corroborated that finding in Dominican Republic. Moreover, all these studies and that of the Ministry of Education of Argentina (2018) concluded that effective schools 1) had teachers with job stability, satisfaction and high sense of belonging to the institutions; and 2) a climate of communication, respect and commitment prevailed in the schools. Lastly, Murillo's (2007) multi-country study also highlights the relevance of the aforementioned factors and adds 4 more related to the school ecology: 1) the socio-cultural level of the students' families; 2) the school information and communication technology; 3) the didactic resources available; 4) the characteristics of teachers.

School effectiveness research in Peru

For the Peruvian case, two studies on school effectiveness stand out. The first one by Cueto, Ramírez y León (2003), worked with schools in Lima and Ayacucho, and sought to analyze the factors associated with school effectiveness. Unlike other studies, the outcome variables were not only cognitive but also included the development of self-concept. The methodology used was quantitative using growth and multilevel models; data was collected from tests on students, surveys applied to

principals, teachers, students and their parents, and through classroom observations. The results showed that, at the *student level*, the variables SES, sex, expectations and language of the student strongly influenced the different outcomes. At the *classroom level*, three characteristics of the classroom ecology stood out: 1) average SES, 2) average age, and 3) classroom climate. While the main features of teaching practices included: 1) time of the teacher in the classroom, 2) feedback to students, and 3) teacher's years of experience.

Another study carried out by the Peruvian Ministry of Education ([MINEDU] 2006), aimed to understand the processes beneath the different performance of students in language and mathematics, in 5 schools in poor areas of Metropolitan Lima. An ethnographic qualitative approach was mainly used; hence, data came from interviews, focus groups, and workshops with the different actors, documentary analysis of the institution and tests to students were also applied. The main findings underlined *school-level factors* regarding school leadership, policies and organization: 1) have clear objectives condensed in a shared vision; 2) a climate that promoted a strong sense of identity and belonging, and respect for minimum standards of coexistence; and 3) cooperation and teamwork among staff. Finally, with respect to teaching practices, the study highlighted 1) the promotion of participation with feedback in classes; and 2) highly structured sessions.

In sum, there is little research about school effectiveness in Peru. Few researchers work in this field, and all of them have focused on the primary level. It is clear that there is a positive and significant relationship between variables related with educational processes at the primary level, while at the secondary level few studies have been published but they do not explore in depth the role of educational processes on educational outcomes. Thus, this study is one of the few studies in Latin America that explores school effectiveness at the secondary

level, as well as the first one that uses a mixed method approach to address this issue in Peru. To this end, we outline an analytical model that introduces into Creemers and Kyriakides (2008) framework some relevant variables for school effectiveness in Latin America and Peru.

1. RESEARCH QUESTIONS AND STUDY DESIGN

Based on the above studies, we know that school process variables have a positive impact on cognitive (academic performance) abilities in students (Scheerens & Bosker 1997; Hattie 2003; Alton-Lee 2003). As such, this study seeks to fill the gap in the literature by addressing the following questions: *i) Which educational processes within schools are most influential in math and reading comprehension of students?* and in the case of the most effective schools, *ii) what is the importance that principals, teachers, and students place on school process variables in explaining educational outcomes?*

To answer these research questions, we use a mixed-method design that follows a sequential explanatory design including two phases: first, we undertake a secondary data analysis, using a random effects model, to estimate the effect of each teacher and school level variables on student achievement in math and reading comprehension. Then, we use the quantitative results to identify effective schools that are part of the second qualitative phase. Specifically, the quantitative analysis will inform the criteria for selecting the cases to investigate in more depth during the qualitative phase, with the purpose that the qualitative data help explain more in detail the role of school processes variable on educational results (Creswell 2013).

2. METHODOLOGY

Data

The data comes from the secondary school survey that is part of the Young Lives Study, an international study following the lives of 12,000 children in four countries (Ethiopia, India, Peru and Vietnam) since 2002. Young Lives has household surveys on two cohorts of children that were born around 1994 (older cohort) and 2001 (younger cohort). Also, the project included school surveys aimed at collecting information about the educational institutions attended by a sub-sample of children from the younger cohort. The first school survey in Peru has data gathered in 2011 when the children were at primary level, and the second one was gathered in 2017 when the children were at the secondary level. This survey captures information about children's backgrounds and experience of schooling (input and educational process variables) and its relationship with learning outcomes such as math and reading comprehension.

The sample under analysis is composed of students from public schools located in urban areas of Peru. We focused on urban schools because most of the schools at this level nationwide are in urban areas (71% in 2017) and in public schools since most students (76% in 2017) attend this school type. Moreover, we focused the analysis on schools that were below the mean socioeconomic average of students for the entire sample, given that our study explores which school fac-

tors seem to be more effective for student learning in poor contexts. For socioeconomic status we used a proxy, which is the wealth index variable¹ available in the Young Lives datasets. After all these filters were applied, we constructed a final sample of 61 schools and 3 237 students (from 3rd, 4th, and 5th grades of secondary school). The data used in the study came from three sources: Peru Young Lives secondary school survey (YLSSS) 2017, which was the main data set used, but we also used the School Census 2017 (MINEDU), and the National Household Survey 2017 (INEI) for complementary data.

In table 1 we summarize the distribution of the selected schools and their students according to the academic performance in the outcome variables of interest. The results are presented comparing high and low performing schools. Each school was assigned to a category,

Table 1
Distribution of schools and students by performance
in math and reading comprehension

Skills	Selected schools	
	High performance	Low performance
Schools		
Math	11	50
Reading	15	46
Students		
Math	585	2652
Reading	1089	2148

Source: Young Lives School Survey 2017. Authors' calculations.

1 This variable is an index comprising three facets of family socioeconomic status: i) assets at home, ii) house quality, and iii) access to basic services. Each measure is normalized in order to take values between 0 to 1. Then the average is taken in order to get a general measure of family socioeconomic status.

whether the scores were above (high) or below (low) the mean for each outcome. No school was located at the exact mean score of either math or reading comprehension.

*Variables and statistical model*²

The two outcome variables are student's scores on math and reading comprehension tests. These scores are standardized for the overall sample and are comparable across grades. Regarding classroom processes, we included information on teaching practices on both the math and language classes for the math and language teacher respectively. In this set of variables, we have teacher-student relationship, satisfaction with community relationship, feedback to students, and math or language classroom climate according to their teachers' point of view. These variables are linked with the studies mentioned in section 1, although they do not cover the full scope of school effectiveness variables identified in the literature. Other teacher demographic characteristics are also included.

At the school level, we included variables that measure both schools' sociodemographic composition as well as infrastructure and resources. Regarding the first set of variables, we consider the average wealth index of the students, the percentage of female students, the percentage of indigenous students, and the number of students per classroom. In relation to the second set of variables, we include: adequate infrastructure, ICT technology resources available at school, and being part of the Full School-day program. The definition of all the variables included in the analysis are detailed in Annex 1.

2 See Annex 1 for further description of the study variables.

To estimate the net effect of each variable and given the nested structure of the data set (students within schools), we used a random effects model to analyze the two outcome variables. This method breaks the error variance in two unobserved components, one at the individual level and other at the school level; thus, we can minimize the type II error as well as have adequate standard error for each independent variable. The model estimated is:

$$Y = X\beta + W\theta + Z\varphi + R\pi + U$$

Where:

- X: Matrix with individual level variables
- W: Matrix with the teacher and classroom level variables
- Z: Matrix with the school level variables
- R: Dummy variables for each administrative region
- $\beta, \theta, \pi, \varphi$: Vector with the marginal effects of each independent variable
- U: $\mu_{.j} + v_{ij}$ where $\mu_{.j} \sim iid(0, \sigma_{\mu}^2)$, $v_{ij} \sim iid(0, \sigma_v^2)$ and i: students / j: schools

The following section present the main findings for teacher and school level variables; however, the regression model includes as regressors characteristics of the student, teachers, school principal, school and fixed effects by administrative region where is located each school.

The coefficients estimated from the model should not be interpreted as an causal explanation for the outcomes, but more as an association between variables, controlling for other variables. However, these coefficients provide interesting results that were further explored in the qualitative component of the study.

3. FINDINGS

3.1. Descriptive analysis

In table 2 we present the difference between students in high and low performing schools in the two outcome variables of interest.

Table 2
Difference in the scores in math and reading comprehension,
at the student level (mean and standard deviation)

Achievement	Mean scores		T-test
	High performance	Low performance	
Math	525.08 (84.94)	457.87 (79.38)	-67.21***
Reading	509.20 (98.18)	457.15 (91.21)	-52.05***

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Source: Young Lives School Survey 2017. Authors' calculations.

Thus, we explore the differences in the school and teacher level variables between the HPS and LPS schools, separately by math and reading comprehension³.

3 Individual characteristics comparisons are presented in Annex 2. Then, we discuss the results from the multivariate analysis.

School level factors

The school's characteristics by performance in math and reading are displayed in Table 3. Most of the school level variables are statistically significant in reading comprehension but not in math. The average wealth index of the students is statistically significant in both areas and HPS have on average students with better economic status than LPS. In reading, we observe that LPS have on average a high percentage of indigenous students, less students per class, and less adequate infrastructure than HPS.

Teacher and classroom level factors

Table 4 presents classroom and teacher characteristics for both groups. However, one needs to keep in mind that this information is from the year that the data were gathered, while math and reading skills have been developed over many years. Therefore, for math and reading performance groups, the reference teacher is the one who was teaching math and language when data was gathered.

In general, students from HPS schools in math and reading have older teachers of math and language, and are more likely to be married than their peers in LPS schools. Regarding teacher-student relationships, the relationship between the math teacher and the students is slightly better in LPS than in HPS schools for both math and reading. On the other hand, in math, a low proportion of students from HPS schools have a math teacher with indigenous mother tongue and a higher proportion of teachers who have university studies. In reading, students from HPS have on average teacher with more years of experience as teacher.

Table 3
Descriptive statistics of school's characteristics,
from HPS and LPS in math and reading comprehension
(reported by the school principal)

	Math			Reading		
	HPS	LPS	T-test	HPS	LPS	T-test
	Mean	Mean	Mean	Mean	Mean	Mean
Demographic composition of students						
Average wealth index of students	-0.23	-0.70	0.47 **	-0.22	-0.75	0.53 ***
Percentage of female students	40%	48%	-9%	48%	47%	1%
Indigenous students (10% or more)	0%	24%	-24%	0%	26%	-26% *
Students per classroom	29.63	26.15	3.48	29.91	25.70	4.21 *
Equipment and infrastructure						
School has an adequate infrastructure	45%	32%	13%	79%	22%	57% ***
ICT resources at the school	4.55	3.98	0.57	4.43	4.00	0.43
Time schedule at school						
Full day school	18%	31%	-12%	29%	29%	0%

***p<0.001, **p<0.01, *p<0.05

Source: Young Lives School Survey 2017

Authors' calculations.

Table 4
Descriptive statistics of classroom and teachers' characteristics,
from HPS and LPS in math and reading, respectively

	Math		Reading		T-test
	HPS Mean	LPS Mean	HPS Mean	LPS Mean	
Demographic characteristics of math/language teacher					
Age in years	51.29	44.56	49.22	45.51	3.71 *
Teacher is married/cohabiting	76%	51%	78%	52%	26% **
Teacher has an indigenous mother tongue	5%	29%	22%	27%	-5%
Teacher is female	14%	21%	50%	59%	-9%
Years of experience as teacher	22.00	18.05	19.56	16.45	3.11 *
Pedagogical qualification and training					
Teacher has university studies	88%	51%	69%	67%	3%
Teacher has attended pedagogical training	81%	83%	81%	75%	6%
Teacher has tenure	67%	64%	72%	67%	6%
Teacher attitudes towards indigenous languages	59.19	58.52	59.97	60.78	-0.81
Pedagogical practices					
Teacher-student relationship	19.1	19.7	19.5	20.4	-0.9 ***
Feedback to students	12.52	13.09	9.58	9.18	0.41
Relationships with community and authorities					
Satisfaction with her/his relationship with different school actors	12.38	12.47	12.22	12.74	-0.52
Satisfaction with the support from educational authorities	7.47	7.75	7.49	7.28	0.20

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$ | Source: Young Lives School Survey 2017 | Authors' calculations.

3.2. Multivariate linear regression analysis

This section shows the net effects of the factors associated with school effectiveness in math and reading comprehension. A first analysis performed is to estimate the amount of variance that is due to individual and family characteristics, and the amount that is due to teacher and school variables. Our results show that most of the variance for math and reading comprehension is due to individual and family characteristics, over teacher and school variables. However, most of the variance explained (percentage of the null variance) comes from variables at the school level variance with 52% and 58% explained in math and reading respectively; while, only 10% and 12% of the individual and family variance was explained in math and reading respectively (see Table 5).

Table 5
Percentage of variance per level
and percentage of variance explained

	Null model		Final model	
	Variance	%	Variance	% explained
Math				
Individual and family	6011.2	84%	5414.0	10%
Teacher and school	1136.7	16%	545.5	52%
Reading				
Individual and family	8197.6	85%	7231.9	12%
Teacher and school	1423.9	15%	598.3	58%

In the results below, to be able to compare the magnitude of the net effects of each variable, we standardized the regression coefficients⁴.

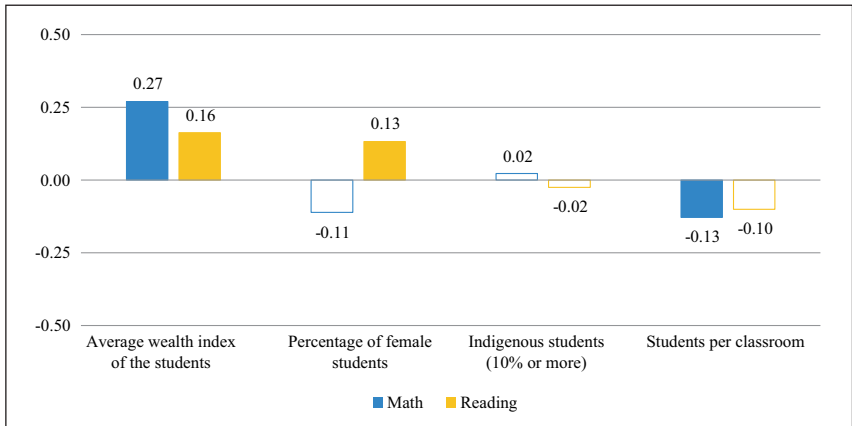
School level factors

At the school level, in Figure 2, among the sociodemographic composition variables several show a significant effect on math and reading comprehension scores. First, the average level of wealth index by school has a statistically significant effect on math and reading scores. Thus, an increment of one standard deviation in the school's wealth index increases math scores by 0.27 standard deviations, and by 0.16 standard deviations for the reading comprehension. Second, schools with lower number of students per classroom have higher scores in math and reading comprehension; an increment in one standard deviation in the number of students per class is associated with a reduction in the math scores in 0.13 standard deviations. Finally, in reading, we found that schools with a high percentage of female students have higher scores (0.13 standard deviations). The percent of indigenous students was not significant; as shown below, indigenous students have lower scores, but this is probably captured by the variable wealth index.

Regarding equipment and infrastructure of the school, in Figure 3, only school infrastructure has a statistically significant effect on reading scores, while no significant coefficient was found for math scores. Thus, an increment in one standard deviation in the composite score

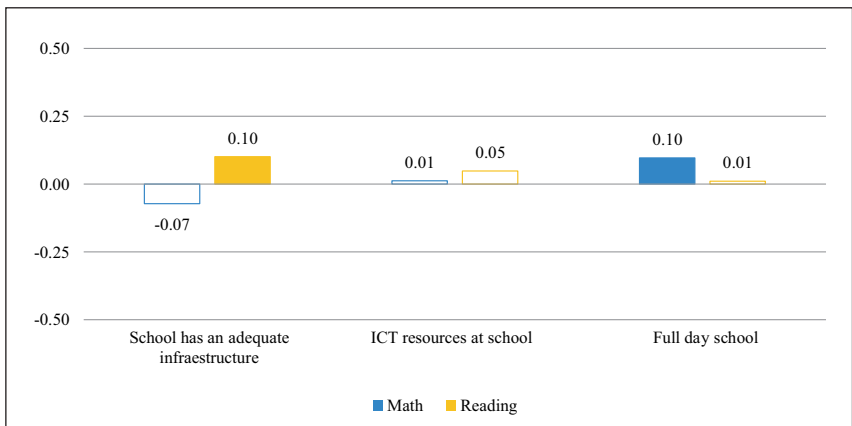
4 The coefficients estimated for all outcomes are presented in detail in Annex 3. For the standardization of the regression coefficients, we multiply each unstandardized regression coefficient by the standard deviation of the independent variable divided by the standard deviation of the dependent variable.

Figure 2
Standardized effects of sociodemographic composition
of the school on the scores in math, and reading



Note: Colored bars indicate that the effect is statistically significant at 5% or less. Bootstrap analyses were conducted with 100 bootstrap replicates.

Figure 3
Standardized effects of ICT resources, infrastructure,
and time schedule of school on the scores in math and reading

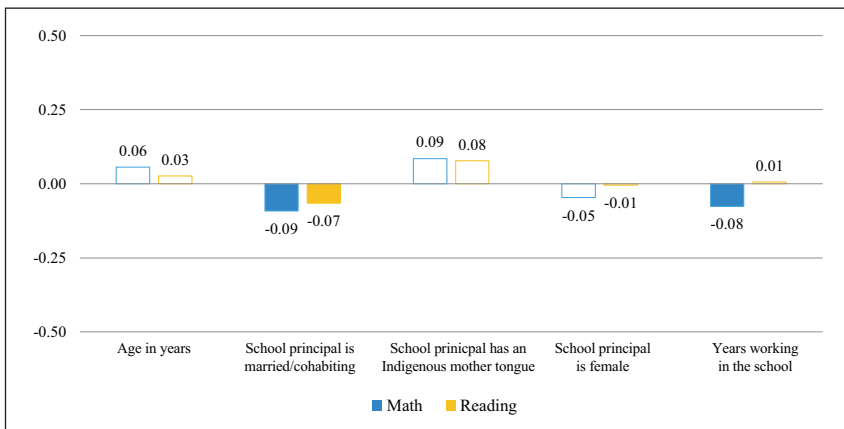


Note: Colored bars indicate that the effect is statistically significant at 5% or less. Bootstrap analyses were conducted with 100 bootstrap replicates.

for school infrastructure increases the reading scores by 0.10 standard deviations. Also, we found statistically significant differences by type of secondary schools, students from full day schools have 0.10 standard deviations more reading scores than those who attend regular school day⁵. Finally, no significant effects were found for ICT resources for the different outcomes considered.

In terms of school principals' characteristics, in figure 4, only marital status and years of experience in the school have a statistically

Figure 4
Standardized effects of school principal characteristics
on the scores of math and reading



Note: Colored bars indicate that the effect is statistically significant at 5% or less. Bootstrap analyses were conducted with 100 bootstrap replications.

5 According to the MINEDU guidelines valid for the period in which this study was conducted, regular secondary schools must comply with a minimum of 1,200 pedagogical hours (45 minutes each) per year. This translates into a daily shift of approximately 5 hours, which can occur in the morning from 8 a.m. to 1 p.m. or in the afternoon from 2 p.m. to 7 p.m. On the other hand, full school-day secondary schools (known as JEC by its acronym in Spanish) must comply with a minimum of 1600 pedagogical hours per year. This translates into a daily shift of approximately 7.5 hours, from 8 a.m. to 3:30 p.m.

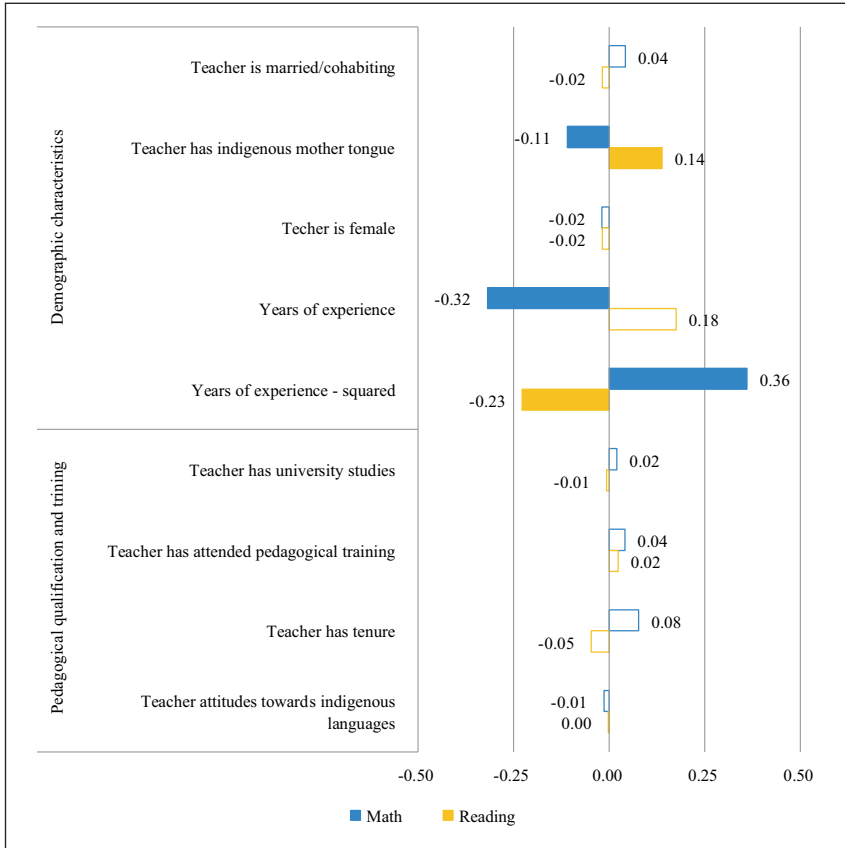
significant coefficient. An increment in one standard deviation in the years of experience in the school reduces the math scores by 0.08 standard deviations; while schools with principals who are married have 0.09 and 0.07 standard deviations less in math and reading respectively, than schools where the principal is not married.

Teacher and classroom level factors

Figure 5 presents the effects of teacher variables. In terms of demographic characteristics, the mother tongue of the math and language teacher has an association with achievement. Students with teachers who speak an indigenous language have 0.11 standard deviations less in math and 0.14 standard deviations more in reading than those who have a teacher who speak Spanish; this is a curious result, which we have not found in previous studies. The advantage in any case would seem to be in reading, with all classes carried out in Spanish in secondary schools in Peru. On the other hand, years working as a teacher have a statistically significant effect in math and reading scores. In math, the relationship is convex, in other words, teachers with a few or a lot years of experience have students with higher scores. For reading the result is different, and the relationship is concave, being teachers with a few or a lot years of experience who have students with lower scores. Again, this is a curious result that should be validated as well the previous result in future studies.

Regarding classroom variables (see Figure 6), the feedback given to students and the satisfaction with the support from different school actors do have a significant, positive effect on achievement in reading. An increase in one standard deviation in feedback index increases in 0.11 standard deviations in students' reading scores, while an increase

Figure 5
Standardized effects of the teacher variables
of the math/language teacher on the scores in math/reading

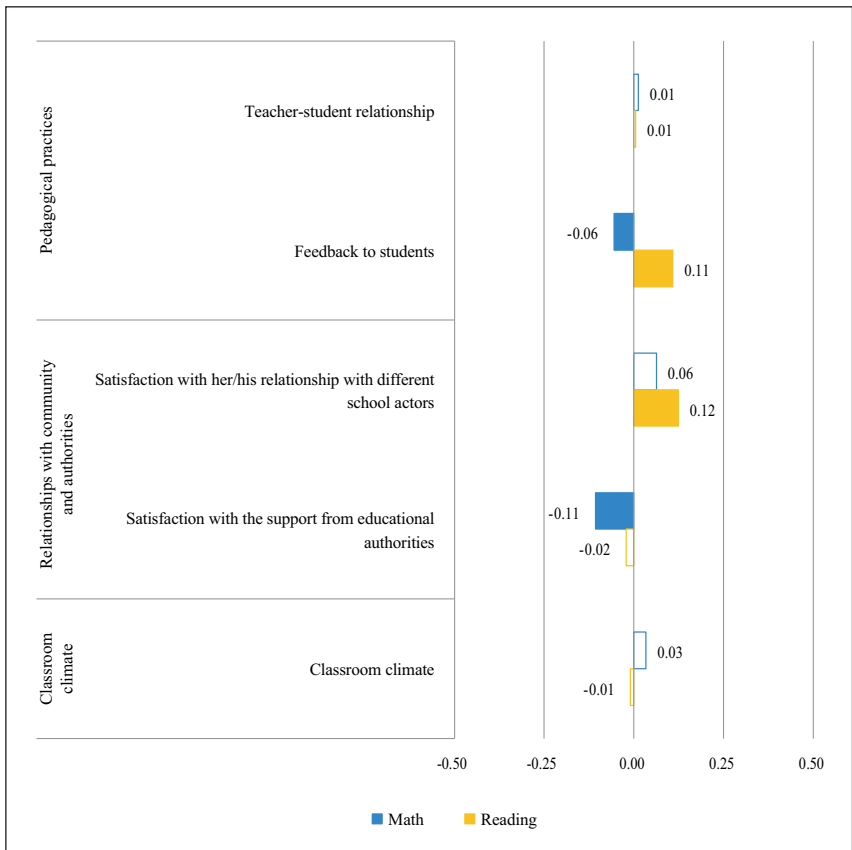


Notes: Colored bars indicate that the effect is statistically significant at 5% or less. Bootstrap analyses were conducted with 100 bootstrap replicates.

in one standard deviation in the satisfaction index increases in 0.12 standard deviations the reading scores. However, in the case of math, teachers' satisfaction with the support from educational authorities and feedback provided to students have a negative significant effect

on math test scores. Thus, an increase in one standard deviation in the support from the authorities is associated with a reduction in 0.11 standard deviations in math scores. And an increase in teachers' feedback in math reduce in 0.06 the math reading scores.

Figure 6
Standardized effects of the classroom level variables of the math and language class on the scores in math and reading respectively

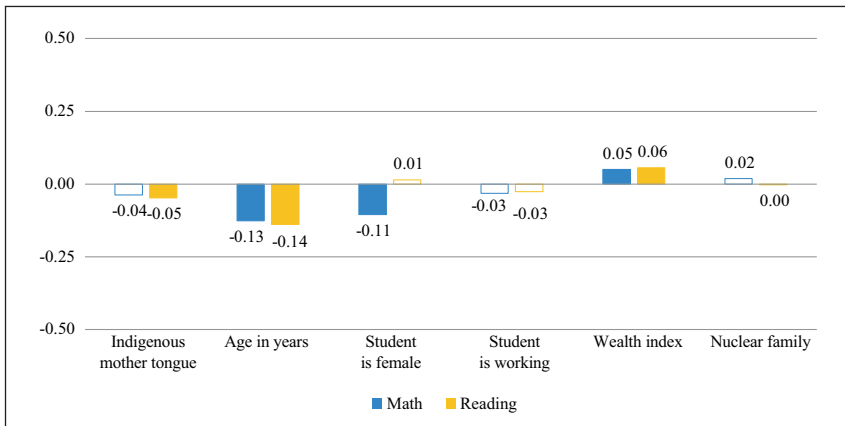


Notes: Colored bars indicate that the effect is statistically significant at 5% or less. Bootstrap analyses were conducted with 100 bootstrap replicates.

Student level

At the student level, we found that -except for family structure and working status- all the other variables considered were statistically significant for at least one of the outcomes analyzed (see Figure 7). We found that students with indigenous mother tongue have lower scores in reading (0.05 standard deviations). On the other hand, an increase of one standard deviation in the student’s age is associated with a reduction in math and reading scores: 0.13 and 0.14 standard deviations respectively. Female students have lower scores in math (0.11 standard deviations); no significant differences were found for reading. Finally, an increase of one standard deviation in the wealth index is associated with an increment of 0.05 standard deviations in math and 0.06 standard deviations in reading.

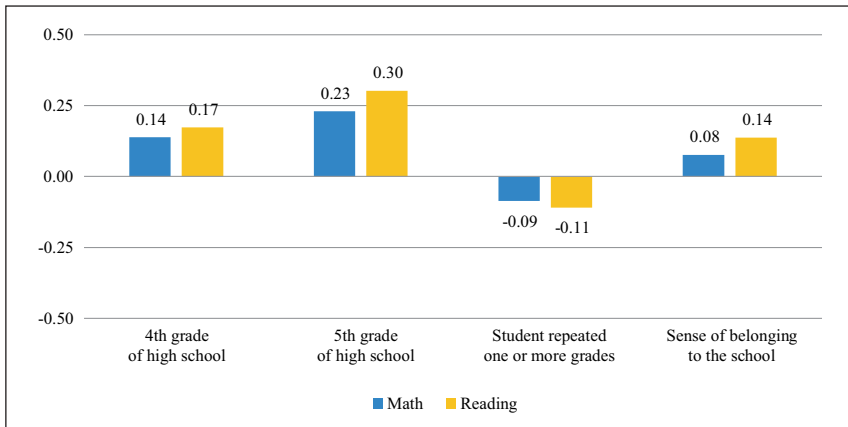
Figure 7
Standardized effects of the student’s demographic characteristics on the scores in math and reading comprehension



Note: Colored bars indicate that the effect is statistically significant at 5% or less. Bootstrap analyses were conducted with 100 bootstrap replicates.

Figure 8 presents the standardized coefficients of the student educational attainment. Students from 4th and 5th year of secondary have higher scores than students from 3rd year. This is an expected result, although not documented before as far as we know. On the other hand, students who repeated one or more times have lower scores in math and reading comprehension. Finally, for the math performance, we see that an increase in the index of sense of belonging to the school increase the scores in math in 0.08 standard deviations, and in 0.14 standard deviations in reading.

Figure 8
Standardized effects of the student educational attainment
on scores in math and reading comprehension



Notes: Colored bars indicate that the effect is statistically significant at 5% or less. Bootstrap analyses were conducted with 100 bootstrap replicates.

In sum, the multivariate analysis shows that the teacher and schools variables have some significant associations with the math and reading scores of the students at secondary level. Among the teacher and classroom level variables, we found that feedback to the students

and the satisfaction with his/her relationship with the educational actors were statistically significant. Thus, among the school processes variables, those related with teacher practices and interactions among educational actors would seem relevant to explain the reading scores of the students. Likewise, among the school level variables, the variables related with the experience of the school principal, average level of wealth index of the school, students per classroom and the infrastructure have an effect to explain the math and reading scores of the students. These findings make it relevant to deepen the understanding of the teacher and school level variables related to educational processes in order to have a better picture of what effective schools do in order to achieve good educational results.

Con el fin de salvaguardar la identidad de los participantes y respetar el principio de confidencialidad establecido durante el recojo de información, todos los nombres utilizados en este documento han sido cambiado por seudónimos. Los nombres de las localidades corresponden al distrito en el que viven; no se menciona el nombre del barrio o comunidad donde crecieron.

4. QUALITATIVE CASE-STUDY

In the previous section of this paper, we characterized effective secondary schools using quantitative data from the YL school survey. In order to further comprehend what difference schools make, we conducted a case study in two schools identified as HPS by the survey, with the aim of analyzing the importance that principals, teachers, and students place on institutional management and pedagogical processes in explaining schools' outcomes. Notably, in these two schools, most of the students have low SES and higher achievement than the average in Math and Language.

We use the quantitative data from the school survey to categorize the schools according to the average wealth of the students as well as their math and reading performance. Then, we did a cross tabulation to identify those schools that on average had students with high achievement in math and reading but the average wealth index was below the mean average for the entire sample. Using this method, we found that all HPS schools in the YL school survey sample -but one- were located in Lima. For the results presented in the next section, two HP urban secondary schools from Lima were intentionally selected following these criteria: having the highest concentration of low-SES students according to the school survey, being located in a peripheral district of Lima, and still having the same principal or vice principal who participated in the school survey. In each school, we conducted in-depth interviews and focus groups with key school actors, including the principal or vice

principal, as well as teachers and students from fifth year of secondary school to gather their perspectives on each school's resources and pedagogical processes. Qualitative data was collected in November 2019, towards the end of the school year.

In the case of the vice principals and fifth-year (final) teachers, we conducted individual in-depth interviews. In the case of fifth-year students, we conducted two focus groups: one with six high-achieving students and another one with six low-achieving students according to school records; in each group the number of female and male students was balanced. High and low-achieving students were included for variability in students' educational experiences and to explore academic support systems, particularly for low-achieving students. We focused on fifth year students because they were about to finish secondary school and could provide information both on their school experience as well as on how school prepared them for their transition to labor market or higher education. Interviews and focus group guides were designed to gather information about institutional and pedagogical management, pedagogical practices, school climate, perceptions of students' achievement, expectations for their future, and schools' strengths and difficulties. Participants provided consent -and in the case of students, assent- for their participation and all ethical considerations for research with children and adolescents were followed. The case study protocol was approved by an IRB in Lima (*Via Libre*).

4.1. Understanding the context: description of the two case study schools

School 1 and School 2 were established 26 and 30 years ago respectively. They are both located in the same area of Ate, a peripheral district

east of Lima, and offer primary education in the mornings and secondary education in the afternoons⁶. School 1 is built on a larger area than School 2, with classrooms made of concrete, wood, and calamine roofs. Overall, School 1's infrastructure is more precarious than school 2's and has been declared by the government as insecure due to a high risk of collapse, though they have plans for reconstruction. School 2 has most of its classrooms made of concrete and calamine roofs, and their rooms and furniture are deteriorated. The funds received annually by both schools from the Ministry of Education (MINEDU, for its acronym in Spanish) for maintaining the infrastructure in good shape are not enough according to principals. Hence, schools generate their own resources through monthly rent of a kiosk and photocopier room, Parents Association's annual membership fees, and fundraising activities.

Both schools are also characterized by having an administration overburdened with work. Principals have a high administrative workload and, consequently, vice principals assume almost all of the school's pedagogical management, even though they are officially in charge of one education level, primary or secondary. Vice principals also assume administrative work, especially in School 1, where there is no administrative support staff.

Both schools serve low-SES students who are characterized by having single parent families, with parents usually absent from home due to long working hours as salespersons, public transportation drivers, housekeepers, and construction laborers, among others. Most of the students' parents were born outside Lima, speak Spanish and an indigenous mother tongue, and have secondary-level education or less. Students in fifth year often have jobs at night or early morning, besides

6 Schools 1 and 2 are regular secondary schools with a daily shift of approximately 5 hours, not full school-day secondary schools.

doing housework such as taking care of younger siblings, grocery shopping, cooking and cleaning. Some of them also attend classes to prepare for university admissions exams. Moreover, vice principals and teachers report that some students have anemia, and many do not have access to good nutrition. These and other challenges faced by students' make them fall asleep during class and leave little time to do homework.

4.2. Findings

The analysis of in-depth interviews and focus groups with vice principals, teachers and students showed that these two HPS schools share a series of school and classroom-level characteristics that promote higher student achievement. In this section we explain that, at the school level, schools have monitoring and teacher training policies to improve the quality of teaching. They also have student discipline and teacher collaboration policies to promote a conducive School Learning Environment (SLE). These are school policies that translate into classroom practices. Correspondingly, at the classroom level, schools are characterized by quality teaching strategies regarding peer-mentoring, feedback and use of materials, and positive classroom learning environments based on teachers' monitoring of students' progress and teacher-student relations of care and trust.

School-level factors

- **There is a clear monitoring and constant teacher training policy in both schools aimed at improving the quality of teaching: *“It is not an act of supervision; the teacher has to reflect on whether what he or she did in class worked”***

Information provided by vice principals and teachers from Schools 1 and 2 shows that teachers receive support to improve their pedagogical practices from both the Local Unit of Education Management (UGEL, by its acronym in Spanish) and the school. While teachers perceive that the UGEL's support is mainly of a supervisory character without offering them concrete feedback, they express that the schools' monitoring and constant teacher training policy, led by vice principals, has made positive impacts on the quality of their pedagogical practice.

In both schools, monitoring is a system in which vice principals observe each teacher during class three times a year, after which they meet to reflect on teachers' strengths and difficulties. At the end of the meetings, teachers sign a commitment to work on the agreed areas of improvement. Both vice principals and teachers have a positive perception of monitoring, though the value they place on this system is somewhat different. Vice principals value monitoring as a key part of the schools' pedagogical policy and use it not only as an evaluation, but mainly as a formative process for teachers. Therefore, vice principals provide teachers with feedback on content knowledge, use of classroom materials, contextualization of class content, feedback to students, student critical thinking and creativity, organization of student teamwork, how to motivate and engage students, teacher-student relations, students' discipline and respect for norms of coexistence. Moreover, vice principals also use monitoring as inputs for constant teacher training. The value teachers place on monitoring is more specific and focuses on the concrete and useful feedback they get from vice principals to improve the quality of their teaching. There are some criticisms, however, since vice principals' workload sometimes result in their offering general -instead of individual- feedback due to their lack of time. Below some quotes reflecting the above:

Throughout the year each teacher is monitored three times. We share the plan beforehand with them, informing the date they are assigned and the rubric that will be used to assess their work. Then, the procedure is to observe the class for 90 minutes. Afterwards, the teacher must come here [vice principal's office] to analyze the session so that he himself realizes his strengths and weaknesses, right? It's not an act of supervision (...), the teacher has to reflect (...) on whether what he did in class worked, or how can he make it better next time (...). And at the end we perhaps get in to nurture him, to perhaps give him some strategies that might help him improve his weak points (...), and in the end, he proceeds to write his commitments as a teacher.

(Interview, School 1 vice principal)

[Monitoring is a form] of evaluation, but also of guidance. According to what we observe, we talk about what we can do about something that perhaps is not working well (...). [We focus on] how the teacher motivates students to get involved, participate, and be interested in class. Another is how he activates reasoning and creativity. Another is how the teacher provides feedback to the student, and another is how he regulates the students' behavior. And lastly, how is his relationship with them.

(Interview, School 2 vice principal)

Yes, three times (...). She (vice-principal) did make observations that helped me. (...) We -the teachers- sometimes have the tendency to tell students everything, without promoting their critical thinking. So, more or less that is the main feedback I have received from the vice principal regarding my way of teaching.

(Interview, School 2 Language teacher)

Schools 1 and 2 also have a constant teacher training policy enacted through three strategies during the school year. These strategies improve teaching through teacher collaboration and sharing lessons learned among teachers, and are also used to coordinate and make decisions about teachers' responsibilities at school. One strategy is Collegiate Work (*Horas Colegiadas*), a space in which both schools gather teachers to work in teams on session planning, coordinate school commissions' work, collaborate on educational projects for national contests, and discuss topics such as student achievement and teaching practices (e.g., results from the Student Census Evaluation). The other two strategies are Inter-learning groups (GIAs by their acronym in Spanish) and micro-workshops, implemented in School 1, and Pedagogical Sessions, implemented in School 2. These spaces are used to discuss teachers' difficulties, previously identified during monitoring, and to share innovative pedagogical practices. Additionally, School 2's Pedagogical Sessions also address teachers' commitment and socio-emotional wellbeing.

All the above-mentioned strategies are promoted by MINEDU and, in theory, implemented in all public schools with the support of UGELs; however, this is not often the case. What is special about Schools 1 and 2 is that both vice principals have adopted these strategies as school policies and have taken full leadership in their implementation, independently from UGEL. These are strategies highly valued by teachers, who acknowledge vice principals' effective guidance as a result of their leadership and qualifications. Vice principals' guidance seems to be related to their previous work experience as UGEL Pedagogical Companion (School 1) and previous graduate studies on Educational Psychology and Socio-emotional Education (School 2).

The idea is that in Collegiate [Work] we coordinate school commissions. And not only that. We also present our problems of more relevance too. For example, which students have academic problems. “Oh yes, I have this student with this problem”, “I also have the same [problem]”. It’s the same [problem], what do we do? That’s the idea, right?

(Interview, School 1 Language teacher)

With GIAs and micro-workshops we [use the information from monitoring] (...) to identify teachers’ pedagogical difficulties and then decide which topics are we going to address. For example, curricular planning, didactic processes, or how to promote critical thinking in students, how to give feedback for example, right? And coexistence as well. Those are still problematic aspects, teachers’ weak points. (...) First, we do an inter-learning group where everyone shows strategies that have given them good results, (...) and in the end we give certain strategies as well.

(Interview, School 1 vice principal)

(...) in the Pedagogical Sessions, for example, besides developing topics that have to do with pedagogical work, I have developed topics that have to do with school climate, right? Emotional management. Last time I did one about teacher selfcare. (...) The benefit has been that in these sessions we not only pay attention to cognitive issues, learning, or teachers’ pedagogical training, but also care for teachers’ socioemotional aspect. That has helped a little for the teacher to have a different attitude.

(Interview, School 2 vice principal)

- **There is a strong school discipline policy that is conducive to a school learning environment (SLE): “*Students’ behavior is much better here than in other schools*”**

The two schools pride themselves for having an environment of discipline which, according to all actors, differentiates them from others in the area. In both cases, discipline is not centered on punishment; instead, they understand it as respect for norms of coexistence, including aspects such as the way students dress and present themselves, cleanliness of classrooms, punctuality, respectful relations between different school actors, among others. Both vice principals insist that coexistence norms be respected. Whenever students break these rules, vice principals have meetings with them and their parents to reflect on these students’ behavior. Moreover, School 2 vice principal created a students’ “reparation” system to promote the compliance of norms, which she perceives as useful for achieving behavioral change. Students have a behavior grade that lowers if they break a coexistence norm. In order to recover lost points, they perform “reparations” according to their abilities, which are actions such as taking care of the library, assisting primary-level teachers, and watching over primary-level students during recess, among others:

No, [this school] is different. We’ve been told our students’ behavior is much better than in other schools, and several teachers who worked before in other schools have told us so. Here, hard work has been done to regulate students’ behavior. Students are calmer here.

(Interview, School 1 vice principal)

(...) Another aspect is that, unlike other schools in the community, there are few cases of misbehaviors. Over there (other school) is the usual, but this school (...) takes good care of its student population, we take care of them.

(Interview, School 2 Language teacher)

In the classroom, students appreciate how teachers maintain discipline because it allows them to pay attention and learn. Even though this information qualifies as a classroom-level factor, we include it here because it shows how the schools' discipline policy affects discipline inside the classroom.

Yes, we as teachers -and principals too- are constantly encouraging them [students] to comply [with the norms]. In the case of promoting student learning, for example, arriving early to class allows students to listen to the whole session, to learn. In their education, what happens is that sometimes we focus more on pedagogy and believe that their own development as persons is not important. (...) But how do we work if a student is disrespectful (...)? How do we work if he is late and interrupts me? How do I work if I observe student's truancy and then his father justifies that? (...) I believe that teaching the norms is for them, to develop as persons.

(Interview, School 2 Civics teacher).

Yes, [teachers] teach us well.

Because they are a bit stricter.

Because they make sure we pay attention and respect the rules.

(Focus group, School 1 high-achieving students)

Besides discipline, the two schools also promote a conducive school learning environment through the creation of spaces for teacher collaboration and interaction through Collegiate Work, GIAs and micro-workshops, and Pedagogical Sessions, as previously explained.

Classroom-level factors

In the previous section, we presented schools' policies to improve the quality of teaching and promote a conducive SLE. The consequences of these efforts can be observed at the classroom level, since information provided by teachers and students show that Schools 1 and 2 share strategies regarding their teaching and make sure that classrooms are learning environments.

- **Teachers provide academic support to high and low-achieving students: *“If we don't understand, he explains to us again the next day we have class”***

Schools 1 and 2 have teachers that are constantly trying to improve students' opportunities to learn through peer-mentoring and feedback strategies during classroom sessions. This is also observed in the dedication they put into preparing extra learning materials for their students, so that they have the chance to practice more complex exercises, which is ultimately related to teachers' expectations for their students to attend higher education.

Teachers from both schools structure their classroom sessions in three moments, where they first contextualize and explain the class topic; then students work mainly in groups, though sometimes individually, to apply what they learned in the first moment; and finally,

students present their work to the class (all observations were carried out pre-pandemic). Three characteristics of the quality of teaching stand out in both schools and demonstrate teachers' academic support to high and low-achieving students. First, teachers use peer-mentoring strategies -especially in Math- when grouping students, so that students with different levels of proficiency work together, expecting that high-achieving students can help their classmates understand class content:

[The group leader] supports the others, (...) I always tell him/her: "try to guide your classmates", so he or she can provide support to their peers' learning. "You are not going to make the group presentation, the one who is a little weak will present". Therefore, they [the group] train him well (...).

(Interview, School 2 Math teacher)

(...) He (the teacher) chooses five leaders among those who know Math well and you have to group with one of them. And then, they (leaders) explain to the group and we solve the exercises together.

(Focus group, School 1 low-achieving students).

Second, teachers from both schools frequently provide students with detailed feedback during class work and on their assignments and evaluations. Teachers provide feedback either individually or to the whole class, which includes explanations of what to improve and why.

For the first revision, I don't grade the assignment. I just check spelling, cohesion, coherence, and give them back the assignment with my indications (...). If any part is missing, maybe the

hypothesis was missing or a claim in the essay, I tell them why. [I also check] if the title relates with the text, if it relates with the problem we discussed in class, I make them see all that. First, in general, for the whole classroom (...), then individually. [I tell them] “Kids, this doesn’t have a grade because it’s a process and you have to continue moving forward, improving. The final product is what I’m interested in”.

(Interview, School 1 Language teacher)

(...) Sometimes some of my classmates make mistakes [in their homework]. He (the Language teacher) explained to them where they failed, or what went wrong with what we did.

(Focus group, School 2 high-achieving students)

If we don't understand, he explains to us again the next day we have class. [Besides grading], he tells us what is wrong [with our work] and explains us why he graded it that way.

(Focus group, School 2 low-achieving students)

Third, while school-level curricular policy dictates the use of MINEDU’s texts for teaching, teachers complement their use with their own selected materials, not only because the number of MINEDU’s texts is insufficient for all students, but mainly because of teachers’ own initiatives to enrich their respective subject areas. Teachers use their own materials if they identify missing content, want to provide more content and of higher complexity, or want to contextualize content to students’ realities and needs. For example, Language and Civics teachers complement MINEDU’s texts with other texts and news articles. In the case of Math, teachers mainly use their own materials, which contain a larger number of exercises and of higher complexity, which resemble

the type of exercises from university admissions exams. This practice is also carried out by School 2 Language teacher when providing students with verbal aptitude exercises; it is all done as an effort for students to have more opportunities to pursue higher education. The cost of additional educational materials (*separatas*, printed materials) prepared by teachers is borne by the families of the students (as a reference, the cost of a separata is S/. 0.20 cents or USD \$ 0.06 cents):

[What is missing from MINEDU's text is] (...) when we talk about democracy or when we talk about justice, or when we talk about corruption. In the book there is no corruption, they don't focus on it, but it's an important topic and one that addresses precisely what is currently happening, and students need to know. So, I don't use the book but, for example, I use newspaper articles, right? And I've asked [students] to bring news articles so that they approach it from their perspective, from their point of view (...).

(Interview, School 2 Civics teacher)

As I always say, I have to add more things because what comes in [MINEDU's] book is insufficient. I have to add more because, as I have always said, working-class people also have the right to go to university, to something more, right? And as I say, my dream has always been that all my students go to university, but I always have to give them something more, I believe.

(Interview, School 2 Math teacher)

We don't use the book, he (the Math teacher) brings us worksheets [prepared by him].

Because he teaches us more advanced [content]. (...).

Yes, more advanced.

Exercises that could help us to get into a university.

So that we are better prepared.

(Focus group, School 1 high-achieving students)

- **Teachers work hard to create a positive learning environment in the classroom: “*They are behind the students, monitoring their school grades, caring about them*”**

Another characteristic of effective Schools 1 and 2 is their effort to promote a positive classroom learning environment through teachers’ monitoring of students’ progress and teacher-student relations of care and trust. Teachers constantly monitor students’ engagement and progress in class, and patiently explain class content until making sure that all students understand.

When they look at me with a sad or doubtful face, [I say:] “What?

You didn’t understand? Ok, I’m going to explain it again, ok?”

Yes, several times until they learn I tell them. (...) I put myself in

their place, I’m very empathetic, I notice it.

(Interview, School 1 Math teacher)

[What we like about the Math teacher is that] he is patient. (...).

That he always supports us.

That he is attentive. For example, one group is not making progress and another one is, and he comes, he approaches and helps you.

He is aware.

He stays there the whole time.

(Focus group, School 2 low-achieving students)

Furthermore, there is a positive, friendly relationship between teachers and students. On one hand, teachers are concerned about students' wellbeing and are aware of the difficulties they face due to their SES and family contexts. Therefore, they create spaces to talk with students in case they need help or guidance in any aspect of their life, not necessarily academic:

I've realized that reflecting with students is what works best. Perhaps to sit with him and talk with him, or in general, maybe an incident happened in the classroom, so the only way is to talk about it (...). (...) In small groups, they get to socialize a little more and they get to tell you something more, maybe a problem, what bothers them. And yes, I make the most of it because at the end I achieve a little more. They let go of their problems, so I also get to give them some suggestions, that "live is not lost, we can't be judging our parents, we don't all have the same possibilities, but we always have to keep going".

(Interview, School 1 Civics teacher).

Students, on the other hand, know their teachers care about them and have high expectations about their future. Therefore, they feel they can trust their teachers and reach out to them, particularly their tutors⁷, for advice whenever they experience difficulties:

My tutor, yes, if she sees that a student is not doing well, she approaches their closest friends (...), tries to find out what is happening with that person. (...).

7 Every class in the school has a tutor. A tutor is a teacher that in addition to teaching his or her subject area, is also responsible for the wellbeing of the students in his or her class.

They (tutor teachers) are behind the students, monitoring their school grades, caring about them.

[Caring] for their wellbeing and also trying to support the classroom so that there is more unity in the group.

(Focus group, School 1 low-achieving students)

Findings from this case study illustrate how these two urban public secondary schools have managed to overcome multiple challenges and promote students' learning beyond what was expected. The factors explaining these successful stories operate at different levels of school organization, from which stand out school-level policies to improve teaching practices and SLE, which relate to classroom-level teaching strategies and the promotion of a positive classroom learning environment. Most of the factors identified above have the potential to be adapted by other schools or turn into policies by the Ministry of Education.

5. DISCUSSION

In order to gain a deeper and more complex understanding of school effectiveness, this mixed-methods study examined the characteristics of effective Peruvian secondary-level urban schools, understood as schools that serve low-SES students and have higher student achievement than average in math and reading comprehension. The quantitative section of this study used the second YL school survey database to identify and characterize effective schools, while the qualitative case-study section used interviews and focus groups to analyze policies and practices in two high performing schools. Our results show several factors explaining school effectiveness at the school, classroom, and student levels.

According to Creemers and Kyriakides' (2008) dynamic model of school effectiveness, school-level policies are expected to affect student achievement directly and indirectly because of their influence at the classroom level, particularly through policies regarding teaching and creating a school learning environment. In agreement with this model, we found from the qualitative case study that effective schools have policies aimed to improve the quality of teaching practices through monitoring and constant teacher training systems. This finding coincides with previous research on school effectiveness showing that schools not only create strategies focused on what is best for student learning, but also promote teachers' ongoing professional development (Bellei, Muñoz, Pérez & Raczynski 2003; López 2006; Murillo 2007).

Although Creemers and Kyriakides' (2008) model centers on schools' processes instead of school actors, it is important to highlight the work of the school vice principals in promoting policies on monitoring and teacher training. Effective schools characterize for their principals' and pedagogical leaders' knowledge and experience (Bellei, Muñoz, Pérez & Raczynski 2003; Murillo 2007), as well as the high value that school communities place on them (Bellei, Muñoz, Pérez & Raczynski 2003). Likewise, we found that teachers value vice principals' effective guidance and attribute it to vice principals' leadership and qualifications. Additionally, our quantitative analysis found that teacher satisfaction with their relationships with different educational actors at the school (principal, colleagues, parents and students) influence reading comprehension. This finding shows that keeping a positive climate among the different educational actors promotes student learning, which is consistent with other studies in the literature review (Bellei, Muñoz, Pérez & Raczynski 2003; López 2006).

Moreover, our findings show that monitoring and constant teacher training school policies may affect student achievement through their indirect effect on improving the quality of teaching practices at the classroom level. Particularly, we found that such school policies seek to improve the way teachers provide feedback, organize teamwork, and contextualize class content, which translate into classroom-level effective teaching strategies regarding feedback, peer-mentoring teamwork, and use of teachers' own materials. On one hand, we show that teachers' feedback is an important factor related to school effectiveness, as other studies have found (Bellei, Muñoz, Pérez & Raczynski 2003; Cueto, Ramírez & León 2003; MINEDU 2006). However, we found a differentiated effect by content area of teachers' feedback: while a positive effect was found in reading comprehension, a negative effect was found in math. A possible explanation for this finding

is the teachers' level of pedagogical content knowledge. In reading comprehension, the feedback could be more related with pedagogical practices than content knowledge, while in math, the feedback relies not only on the knowledge of pedagogical practices but also on the teachers' content knowledge. Thus, several studies developed at primary level in Peru have shown the poor level of teachers' content knowledge in math as well as the poor feedback given to the students in this content area (Guadalupe, León & Cueto 2013; Cueto, León, Ramírez & Guerrero 2008; Guadalupe, León, Rodríguez & Vargas 2017), a similar phenomenon could explain this finding at secondary level and it requires developing pedagogical studies about the level of pedagogical content knowledge of the teachers, and the differences by content domain.

On the other hand, the qualitative study showed that teachers from effective schools use peer-mentoring strategies as part of student teamwork, in which high-achieving students can help their classmates learn class content. This finding aligns with previous research that shows larger achievement gains for students, particularly low-achieving students, when grouped heterogeneously instead of homogeneously (Murphy et al. 2017; Saleh, Lazonder & De Jong 2005). Also important for school effectiveness, according to our findings, is teachers' use of their own materials to complement MINEDU's texts with the goal of enriching and contextualizing class content. This coincides with Bellei, Muñoz, Pérez & Raczynski (2003), who found that teachers from effective schools create and select didactic materials to motivate their students and explore and deepen class content.

Besides policies to improve the quality of teaching practices, our findings from the qualitative study show that effective schools have policies to foster a positive school learning environment. One way of doing this is through the promotion of teacher collaboration taking

place during co teacher training, in which teachers learn from each other's pedagogical strategies and come up with joint solutions to shared difficulties. According to previous research, effective schools have an environment where teachers can cooperate and work as a team (Concha 2006; López 2006; MINEDU 2006; Murillo 2007).

Furthermore, we found that schools' policies to promote a learning environment emphasize student discipline and respect of coexistence norms, as well as positive teacher-student relations. These policies are strengthened through monitoring and constant teacher training, given that they not only focus on the quality of teaching practices, but are also concerned with how teachers regulate student behavior and establish positive interactions with students in class.

This result coincides with other studies' findings on the relationship between student achievement and a positive school climate that has clear and explicit management of discipline and respect for minimum standards of coexistence (Bellei, Muñoz, Pérez & Raczynski 2003; MINEDU 2006; OECD 2019b). In our study, school discipline policy has not only made positive impacts on classroom-level discipline but is also a school characteristic that produces pride in all school actors, who conceptualize discipline as a way for schools to care for their student population and as a necessary condition for learning to happen. Thus, discipline and corresponding student behavior in respecting coexistence norms is highly valued and expected at the classroom level.

Schools' promotion of positive teacher-student relations is also reflected in the type of interactions happening inside the classroom. In practice, those relations feature teachers' support regarding students' progress and teachers' patience in explaining class content and their high expectations towards students' academic futures, characteristics associated with student achievement according to other studies (Bellei

Muñoz, Pérez & Raczynski 2003; Concha 2006; Cueto, Ramírez & León 2003; López 2006; Murillo 2007; OECD 2019b). These interactions foster friendly relations of care and trust, which in turn result in students reaching out to teachers for advice.

What links classroom-level factors related to school effectiveness in this study is the fact that teachers adapt their behavior to students' characteristics in order to provide all of their students with opportunities to learn. Creemers and Kyriakides (2008) refer to this as differentiation, "the extent to which activities associated with a factor are implemented in the same way for all the subjects involved with it" (p. 87). According to the authors, catering an activity to students' specific needs increases the activity's benefits for students' outcomes. Similarly, Bellei, Muñoz, Pérez & Raczynski (2003) and López (2006) argue that effective schools adapt their methodologies to students' characteristics, particularly to low-achieving students. Our results show that teachers from effective schools are aware of students' contexts, the difficulties they face, and what they need to improve their learning outcomes. With that knowledge, teachers can cater their teaching strategies and establish positive relations to benefit all, both high and low achieving students. Teachers also provide a type of support that goes beyond students' academic achievement and includes an overall concern for their wellbeing.

As previously mentioned, Creemers and Kyriakides' (2008) model centers on schools' processes and thus does not include input variables such as class size, school infrastructure and aggregated school SES. However, we included these factors because they are associated with student achievement, according to our quantitative results and previous research on the topic. In Latin American countries such as Peru, where there is a large variance between schools, the quality of schools' infrastructure and access to basic water, electricity and sewage services

are relevant factors affecting student outcomes (Concha 2006; Murillo 2007; Murillo & Román 2011; Duarte, Gargiulo & Moreno 2011). Similarly, previous research concludes that increases in school SES are associated with increases in student performance (Cervini 2006; McConney & Perry 2010; Miranda 2008; Duarte, Gargiulo & Moreno 2011; Muelle 2020).

In their dynamic model of school effectiveness, Creemers and Kyriakides (2008) also explain that classroom-level factors have a bidirectional relation with student-level factors, given that they influence students' characteristics and are influenced by them. Additionally, student-level factors have a direct effect on academic achievement. Our quantitative data on students' background characteristics showed that high-achieving students have a non-indigenous mother tongue (Spanish), an age appropriate for their grade, lower school repetition, higher household SES, and study in a higher grade-level. Additionally, being a male is associated with higher math achievement. These student-level results emphasize the importance of addressing inequality in education, which have been largely documented by previous research, particularly regarding students' SES (e.g., Cueto, Ramírez & León 2003; Miranda 2008; Cueto, Miranda, León y Vásquez 2016; León & Collahua 2016; León & Youn 2016; OECD 2019a; Muelle 2020).

Students' sense of belonging is another student-level factor related to school effectiveness, according to our quantitative study. As previous research states (Cueto, Guerrero, Sugimaru & Zevallos 2010; León & Youn 2016; OECD 2019b; Muelle 2020), we found that students with higher sense of belonging at school have higher academic achievement. Moreover, research shows that students' sense of belonging is associated with teacher support (Arends & Visser 2019; Ma 2003) and a positive school disciplinary environment (Ma 2003).

We cannot establish a relationship between the quantitative results on students' sense of belonging and the qualitative results on classroom-level learning environment of discipline and positive teacher-student relations. However, it is possible to suggest that a conducive classroom learning environment, as we found from the qualitative study, may foster students' sense of belonging.

It is clear that class size, schools' infrastructure, aggregated SES, and students' background characteristics benefit some students more than others in terms of their learning opportunities. Such results mirror the larger structural social inequalities embedded in Peru. While inequalities must continue to be addressed by the joint effort of different government sectors, our results show what can be done from the education sector to counteract the effects of schools' low-SES related difficulties. We highlight the power that school-level policies and their influence in classroom-level practices have in providing better opportunities to students.

Lastly, the aforementioned results point out the importance of the pedagogical work of the different educational actors inside the school. Therefore, educational programs carried out by local and national governments need to pay more attention to dynamics within the school in order to mitigate educational inequalities, and increase the opportunities for children in impoverished public schools.

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Annex 1. List of variables included in the analysis.

The dependent variables are:

- *Math and reading comprehension scores:* continuous variables that include the scores obtained by the students in math and reading tests. The final scores were built using a 2PL model from Item Response Theory. Finally, the scores were fixed using a mean of 500 and a standard deviation of 100 for all the sample. Thus, the resulting scores for each skill are comparable among grades and years.

The independent variables at individual level are:

- *Wealth index:* The wealth index built differs from the main study since we include two more indicators. The five variables included in the index are: i) number of home assets, ii) access to basic services, iii) quality of the house infrastructure, iv) house overcrowding, and v) cultural capital (higher level of education obtained by the parents).

To have a more accurate weight for each component of the wealth index, we chose to calculate the weights for each component using the 2017 National Household Survey (ENAH0). We

performed a Principal Components Analysis to obtain the weight for each component from a national representative sample. Once the value of each component was established, we proceeded with the following equation to estimate the level of wealth index of the household for the school survey data:

$$Wealth = Assets_{std} * 0.32957 + Services_{std} * 0.32969 + House\ Quality_{std} * 0.32269 + Cultural\ Capital_{std} * 0.24483 + Overcrowding_{std} * 0.14823$$

Where the sub-index (std) means that we are using the standardized variables.

- *Nuclear family*: dichotomous variable that takes the value of 1 if the student's family is composed by the two parents, and 0 otherwise.
- *Indigenous mother tongue*: dichotomous variable that takes the value of 1 if the mother tongue is an indigenous language, and 0 otherwise.
- *Age*: number of years of the student.
- *Student is female*: dichotomous variable that takes the value of 1 if the student is female, and 0 otherwise.
- *Student works*: dichotomous variable that takes the value of 1 if the student has a job (paid or not), and 0 otherwise. The question prompted to the student was: Besides going to school, do you work? For example, in a farm, on the street, in a business or in another house.
- *Grade of study*: nominal variable that reflects the grade in which the student is placed. Reference grade is 3rd grade of secondary school.
- *Student repeated a grade one or more times*: dichotomous variable that takes the value of 1 if the student repeated any grade at school one or more times, and 0 otherwise.

- *Sense of belonging or identification with the school:* it was built using a set of 6 statements about the perceptions of the student with regard to their satisfaction in the school and the relationships with other students. The scale took values among 1 and 4. When necessary the sign of some items was changed. A simple addition of the 6 statements was performed, and a Cronbach's alpha was calculated, which was 0.70 to the whole sample and 0.67 to the sample of students from schools of low socioeconomic status.

The independent variables at teacher and classroom level are:

- *Teacher's age:* Number of years since the birth of the teacher
- *Teacher is married/cohabiting:* dichotomous variable that takes the value of 1 if the teacher is married, and 0 otherwise.
- *Teacher is female:* dichotomous variable that takes the value of 1 if the teacher is a female, and 0 otherwise.
- *Number of years working as teacher in the school:* number of years that the teacher has been teaching in the school where surveyed.
- *Number of years working as teacher in the school (squared):* the squared of the number of years that the teacher has been teaching in the school where surveyed.
- *Teacher studied at the university:* dichotomous variables that takes the value of 1 if the teacher studied at the university, and 0 otherwise.
- *Teacher training:* dichotomous variable that takes the value of 1 if the teacher received any pedagogical training of more than 20 hours in the last 2 years, and 0 otherwise.
- *Teacher tenure:* dichotomous variable that takes the value of 1 if the teacher is part of the Teaching Public Career, and 0 otherwise.

- *Teacher attitudes towards people who speaks an indigenous language:* The teachers of math and reading answered a set of questions regarding their perceptions towards indigenous languages. They had 4 options to answer to each item to express their level of agreement or disagreement with 16 statements. When necessary the sign of the items was changed. A simple addition was made, and a Cronbach's alpha was computed (0.74 for the math teacher and 0.93 for the reading teacher).
- *Teacher student relationship:* calculated for both teachers of math and of reading, from the students' answers to a set of 6 statements regarding attitudes of the teacher towards the students. The scale took values from 1 to 4. A simple addition was made, and then a Cronbach's alpha was computed (0.94 for the math teacher and 0.90 for the reading teacher).
- *Teacher's feedback to students:* variable that takes into account the actions of feedback that both the math and the reading teacher reported to have done: give back homework with comments, give back homework with grading, give back tests with comments, and solve the tests after applying them to the students. The scale took values from 1 to 4 according to the frequency with which these actions were taken. A simple addition was made, and a Cronbach's alpha was calculated (0.61 for the math teacher and 0.66 for the reading teacher).
- *Teacher's satisfaction with educational actors:* Variable built from the perceptions of the teachers of math and of reading concerning their relationships with the school's principal, other teachers in the school, their students, and the parents. The scale took values from 1 to 4. A simple addition was made, and a Cronbach's alpha was calculated (0.72 for the math teacher and 0.58 for the reading teacher).

- *Teacher's satisfaction with the support of educational authorities:* variable built from the perceptions of the teachers of math and of reading regarding the support received from the school's principal, external education authorities, and from their colleagues. The scale took values from 1 to 4. A simple addition was made, and a Cronbach's Alpha was calculated (0.63 for the math teacher and 0.62 for the reading teacher).
- *Classroom climate in math/reading class:* calculated for each classroom of math and of reading, from the students' answers to a set of 6 statements concerning how often certain events occur in the classroom. The scale took values from 1 to 4. A simple addition was made, and then a Cronbach's alpha was computed (0.83 for the math classroom and 0.76 for the reading classroom).

The independent variables at school level are:

- *School principal age:* number of years since the birth of the principal.
- *School principal is married/cohabiting:* dichotomous variable that takes the value of 1 if the principal is married, and 0 otherwise.
- *School principal has an indigenous mother tongue:* dichotomous variable that takes the value of 1 if the principal's mother tongue is and indigenous language, and 0 otherwise.
- *School principal is female:* dichotomous variable that takes the value of 1 if the principal is a female, and 0 otherwise.
- *Number of years that school principal works in the school:* number of years working in the school as school principal.
- *Average wealth index of the students:* variable that averages the wealth index of each student per school, turn, grade, and classroom.
- *Percentage of female students:* variable that indicate the percentage of female students of the total of students in high school per school.

- *Indigenous students at school:* variable that takes the value of 1 if 10% or more of the school enrollment is indigenous, and 0 otherwise.
- *Students per class:* variable indicating the average number of students per class in high school per school.
- *Adequate school infrastructure:* variable composed from two indicators. One reflects the quality of the materials of the floor, walls and roofs in the school. The second indicator indicates the access to services such as phone line, internet, and connection to the water and drain systems.
- *Full school day:* variable that takes the value of 1 if the school is part of the Jornada Escolar Completa program and 0 otherwise.

Annex 2 Individual characteristics comparison between HPS and LPS in math and reading

Variables	Math		Reading	
	HPS Mean	LPS Mean	HPS Mean	LPS Mean
				Difference
Demographic characteristics				
Student has an indigenous mother tongue	4%	14%	8%	15%
Age in years	15.5	15.3	15.4	15.3
Student is female	52%	59%	66%	54%
Student is working	23%	28%	16%	33%
Wealth index	-0.26	-0.61	-0.18	-0.73
Nuclear family	72%	74%	71%	74%
Educational attainment				
Grade (base category: 3rd grade of high school)				
4th grade of high school, (%)	58%	47%	62%	43%
5th grade of high school, (%)	42%	30%	35%	29%
Student repeat one or more grades	22%	26%	20%	28%
Sense of belonging to the school	19.3	19.0	19.4	18.9
Classroom climate				
Math classroom climate	18.0	17.8	-	-
Language classroom climate	-	-	17.2	17.8

***, p<0.001, **, p<0.01, * p<0.05

-7% ***

0.13 ***

11% ***

-17% ***

0.55 ***

-3%

19% ***

6% ***

-7% ***

0.5 ***

-0.6 ***

Annex 3
Factors associated to performance in math for students from poor public schools located in urban areas

	MATH		READING	
	β	std (β)	β	std (β)
Student level factors				
Indigenous mother tongue	-9.09 (4.76)	-0.04	-13.45 (5.58)	* -0.05
Age in years	-10.72 (2.18)	*** -0.13	-13.55 (2.53)	*** -0.14
Student is female	-17.93 (2.85)	*** -0.11	2.93 (3.76)	0.01
Student is working	-6.12 (3.76)	-0.03	-5.71 (4.26)	-0.03
Wealth index	4.59 (1.88)	* 0.05	5.77 (2.52)	* 0.06
Nuclear family	3.59 (3.51)	0.02	-0.61 (3.75)	0.00
Grade (base category: 3rd grade of high school)				
4th grade of high school	23.22 (6.15)	*** 0.14	33.34 (5.71)	*** 0.17
5th grade of high school	41.14 (8.50)	*** 0.23	63.23 (7.40)	*** 0.30
Student repeated one or more grades	-16.98 (4.49)	*** -0.09	-24.76 (4.82)	*** -0.11
Sense of belonging	2.39 (0.58)	*** 0.08	4.97 (0.76)	*** 0.14
Teacher and classroom level factors				
Teacher is married/cohabiting	7.35 (5.23)	0.04	-3.51 (7.00)	-0.02
Teacher has indigenous mother tongue	-20.41 (7.59)	** -0.11	29.80 (10.38)	** 0.14
Teacher is female	-3.98 (6.56)	-0.02	-3.47 (5.33)	-0.02
Years of experience	-3.16 (1.40)	* -0.32	2.20 (1.54)	0.18
Years of experience - squared	0.09 (0.03)	** 0.36	-0.08 (0.04)	* -0.23 ▲

	MATH		READING	
	β	std (β)	β	std (β)
Teacher has university studies (base category: studies in institute)	3.49	(5.17)	-1.25	(6.23)
Teacher has attended pedagogical training	8.95	(6.35)	5.40	(6.64)
Teacher has tenure	15.00	(8.64)	-10.28	(7.15)
Teacher attitudes towards indigenous languages	-0.20	(0.42)	-0.05	(0.52)
Teacher-student relationship	0.23	(0.33)	0.13	(0.54)
Feedback to students	-1.97	(0.97) *	6.21	(1.45) ***
Satisfaction with her/his relationship with different school actors	2.94	(1.61)	6.04	(1.40) ***
Satisfaction with the support from educational authorities	-5.42	(1.74) **	-1.18	(1.69)
Classroom climate	0.79	(0.47)	-0.30	(0.59)
School level factors				
Age in years	0.86	(0.53)	0.45	(0.70)
School principal is married/cohabiting	-19.13	(6.68) **	-15.90	(6.89) *
School principal has an Indigenous mother tongue	16.88	(12.04)	17.47	(14.50)
School principal is female	-10.66	(6.89)	-1.39	(7.46)
Years working in the school	-1.49	(0.54) **	0.11	(0.70)
Average wealth index of the students	44.50	(9.53) ***	29.22	(8.90) **
Percentage of female students	-44.66	(30.31)	61.33	(30.50) *
Indigenous students at school (10% or more)	4.95	(9.02)	-6.51	(11.33)
Students per classroom	-1.77	(0.72) *	-1.45	(0.75)
School has adequate infrastructure	-12.13	(6.37)	19.27	(8.13) *
ICT resources at school	0.99	(2.28)	4.67	(3.19)



	MATH		READING	
	β	std (β)	β	std (β)
Full school day	17.49 (6.22) **	0.10	1.95 (8.11)	0.01
Constant	696.07 (65.37) ***	-	438.59 (80.00) ***	-
Students	2607		2615	
Schools	55		57	
Percentage of variance at individual level	9%		8%	
Percentage of variance at school level	91%		92%	

Nora: Robust standard errors in parentheses. Significance levels denoted by *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Results with significance at 90% were omitted due to the presence of null value in the interval of confidence.

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A mixed methods study in secondary schools in Peru

Editing completed
in May 2021

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This study contributes to the scarce literature on school effectiveness in secondary education in Peru by addressing the following questions: i) which educational processes within schools are most influential in math and reading comprehension? and in the case of the most effective schools, ii) what is the importance that principals, teachers, and students place on school processes variables in explaining educational outcomes? We use a mixed-method design that follows a sequential explanatory design. Our results point out the relevance of school process variables at the school level. Therefore, educational programs carried out by local and national governments should pay more attention to the dynamics within the school to mitigate the educational inequalities, equalizing upwards the opportunities for children in impoverished public schools.

ISBN: 978-612-4374-39-5



9 786124 374395



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Additional support by

