POLICY RESEARCH WORKING PAPER 8970

Using Student and Teacher Assessments to Design More Pertinent In-Service Teacher Training

The Case of Ecuador

Diego F. Angel-Urdinola
Sebastian Burgos-Dávila

WORLD BANK GROUP
Education Global Practice
August 2019

Abstract

The development of pertinent and effective in-service teacher training remains a policy challenge for many countries in Latin America and the Caribbean. Ecuador stands out as a country in the region that has made significant investments in teacher training in the past decade. However, most in-service training provision has been designed without enough elements to properly address teachers' skills gaps. This paper proposes a roadmap for improving the design of in-service teacher training in Ecuador using available data from student and teacher assessments. Although countries in the region have made important efforts to carry out periodic evaluations of student and teacher performance, the data resulting from these evaluations are rarely used to guide teacher development programs. The analysis presented in this paper suggests that doing so has the potential to raise program pertinence while allowing the prioritization of investments in teachers and students with the greatest needs.

Using Student and Teacher Assessments to Design More Pertinent In-Service Teacher Training: The Case of Ecuador

Diego F. Angel-Urdinola and Sebastian Burgos-Dávila

The World Bank[1]

I.   Introduction

In-service teacher training is an essential component of Ecuador's teachers' professional development strategy. However, available training interventions offered by the state do not necessarily respond to the teachers' skills gaps. This occurs because available training programs do not systematically rely on diagnostics of the teachers' needs. This paper proposes a roadmap for improving the design of in-service teacher training in Ecuador using available data from student and teacher assessments. Current teacher assessments in Ecuador have an active cognitive component capable of assessing the level of knowledge of teachers in the field they teach. They provide valuable information for determining the specific areas of knowledge that teachers have problems with. Coupling such information with available data on student academic achievement, the state could develop not only more pertinent in-service training programs, but also target interventions to teachers that serve the student populations with the greatest needs.

Many countries in Latin America and the Caribbean (LAC) face shortages of good teachers, which undermines the capacity of their systems to improve student achievement in the short, medium, and long term (Rivkin, Hanushek, and Kain 2005; Hanushek and Woessmann 2006; Figlio and Kenny 2007; Chetty, Friedman, and Rockoff 2014). Individuals who become teachers in LAC, most of whom are female, tend to be socioeconomically vulnerable and to underperform in university entrance exams compared to the average university student (Bruns and Luque 2014). Many structural factors explain this phenomenon, such as the lack of incentives to choose teaching as a profession and high turnover of teachers (Ingersoll 2004; Woessmann 2011; Muralidharan and Sundararaman 2011). Moreover, salaries for teachers in the LAC region tend to be substantially lower than in the average profession (Moura-Castro and Ioschpe 2007), which limits the capacity of the sector to attract the best professionals.

Despite remarkable progress in teachers' educational attainment (at present, most teachers in the LAC region have completed a tertiary degree), graduates from the teaching profession enter classrooms with significant cognitive and pedagogical gaps (Bruns and Luque 2014).[2] These deficiencies weaken education systems in the region, as teachers' cognitive skills influence the achievement of their students (Hanushek, Piopiunik, and Wiederhold forthcoming).

---

[2] According to data from Ecuador's Ministry of Education (MINEDUC), the public system of primary education in Ecuador employs 163,999 teachers. Of this total, 81 percent have a bachelor's degree in education, 14 percent have a postgraduate degree (mainly in education), and the remaining 5 percent are not college graduates.

In response to the cognitive gaps of teachers, countries in LAC have relied on in-service teacher training as part of their teachers' professional development strategies (Levy and Schady 2013; Avalos 2007). In-service teacher training is a significant element of non-salary spending in most LAC education systems (Bruns and Luque 2014). In some countries in the region, teachers participate in training between 21 and 35 days per year (OECD 2009).

A primary weakness of in-service teacher training programs is that they seldom respond to the actual skills gaps of teachers (Bruns and Luque 2014; Popova et al. 2018). Ávalos (2007) conducted a review of several in-service teacher training programs in LAC. The study concludes that in-service teacher training in the region should focus more on strengthening teachers' cognitive deficiencies, given the fragility of their initial training. Although teacher effectiveness involves several factors (such as adequate mastery of the curricula, high motivation, and proper use of pedagogy), the author highlights the importance of prioritizing training efforts in the region as a corrective measure to help teachers reach an adequate mastery of the curricula.

Ecuador has made substantial efforts to improve teacher quality in recent years. In the past decade, the Government of Ecuador has embraced important reforms in teacher development practices including (a) periodic assessment of teachers through standardized tests; (b) setting standards for the admission of teachers into the elite group of nationally recognized teachers, known as the *Magisterio Nacional*; (c) better teacher remuneration, partially linked to performance evaluations; (d) the development of a structured teaching career path; and (e) creation of the National Education University (*Universidad Nacional de Educación*) for new teachers (Angel-Urdinola and Vera-Jibaja 2018).[3] Moreover, Ecuador has invested significant resources in teacher training.

Nevertheless, in-service training programs in Ecuador have not necessarily responded to teachers' development needs, and their effectiveness remains unassessed. Teachers who underperform in their knowledge assessments do not always participate in available training programs, take-up rates for some available programs are low, and there is no hard evidence that training programs have contributed to improving teaching effectiveness or student learning.

---

[3] Between 2006 and 2015, teacher salaries increased on average from US$396 to US$817 per month (surpassing inflation). Moreover, 17,000 new teaching positions were created from 2011 to 2013, contributing to an 11 percent expansion in the number of teachers employed by the MINEDUC (Harvey 2016). In 2016, 90.6 percent of the teachers were regularized with open-ended appointments, and 29.4 percent (or about 479,000 teachers) benefited from a salary increase due to the *Recategorización* Program.

This paper proposes a roadmap for improving the design of in-service teacher training in Ecuador using available data from student and teacher assessments. Even though Ecuador has made substantial efforts to periodically evaluate student and teacher performance, the data resulting in these evaluations have not been used systematically to guide teacher development programs. The results of this study indicate that systematically using the data has the potential to help design more relevant programs that respond to observed skills gaps and allow prioritizing investments in teachers and students with the most substantial needs.

The study also intends to raise awareness about the potential gains of capitalizing on available information on student and teacher assessments. Many top education systems invest heavily in student and teacher evaluations. Finland, Japan, the Republic of Korea, China, the United States, and Singapore, among others, all have robust systems that rely on comprehensive student and teacher assessments that serve as inputs to develop more pertinent in-service teacher training programs. However, to date, the use of data resulting from teacher evaluations in Latin America for formative purposes is much more limited (Bruns and Luque 2014). Chile and Mexico are the education systems in Latin America with the most consolidated systems of teacher evaluation. Among other information, both systems collect information about teachers' cognitive skills. Data resulting from these assessments are often used to make decisions about a teacher's career progression, but not necessarily to develop tailor-made in-service training programs. Thus, the framework presented by the study applies to other countries that, like Ecuador, dispose of detailed information about cognitive skills gaps of teachers, but largely underuse it.

The paper is structured as follows. Section II briefly describes the design and implementation of, and investments made in, in-service teacher training in Ecuador by the Ministry of Education (MINEDUC) under its main national teacher development program, the Comprehensive System for the Development of Education Professionals (SIPROFE) program. Section III provides a brief overview of the information collected by the national teacher's assessment (*Ser Maestro*) and discusses how the information included in this assessment could guide the design of in-service training courses. Section IV presents different policy scenarios that use data from student and teacher evaluations to better design in-service teacher training. A brief conclusion follows.

II.   In-service teacher training in Ecuador

In 2011, Ecuador enacted a new education law (*Ley Orgánica de Educación Intercultural*) that provided the education sector with a renewed vision of the country's educational processes and actors. The law recognizes and gives high value to the work of teachers and introduces important elements to promote and develop the teaching career. For instance, Chapter 4 of the law specifies that teachers in Ecuador shall have free access to professional development opportunities, such as in-service training, to continuously update their knowledge and pedagogical practices. Chapter 10 establishes the need for the creation of a National University of Education, whose objective would be to support and develop the teaching profession and to better train new teachers. The law also establishes a more transparent teaching career path, whereby promotions are based on obtaining satisfactory results in teaching evaluations and on active participation in continuing education programs.

In 2008, the MINEDUC began making important efforts to promote in-service teacher training through its Comprehensive System for the Development of Education Professionals (SIPROFE), overseen by the MINEDUC's Undersecretariat of Professional Development. SIPROFE's main objective is to improve the country's education quality through the provision of training to teachers and school administrators. To deliver in-service teacher and administrator training, the SIPROFE offers a variety of courses, including remedial and developmental courses, orientation to new teachers, and school management. The duration of courses varies between 8 and 60 hours, although most courses have a duration of either 20 or 40 hours (MINEDUC 2016). Some courses are sequential (that is, are a prerequisite for others) to promote and incentivize the sustained participation of teachers. Training programs under the SIPROFE have traditionally been delivered through agreements with universities and pedagogical institutes (*Institutos Superiores Pedagógicos*, ISPED) that satisfy predetermined quality and service delivery requirements.[4]

Data from the MINEDUC suggest that during 2010–18, the SIPROFE program delivered in-service teacher training to about 113,000 teachers (representing about 75 percent of the total teacher population). According to the MINEDUC, between 2015 and 2018, the program benefited

---

[4] ISPEDs do not operate anymore. Also, universities that can participate as providers of training under the SIPROFE program have to satisfy the maximum level of accreditation (Level A). This requirement limits the territorial supply of training courses, as not many regional universities satisfy this requirement.

an average of over 10,000 teachers a year, with an average yearly investment of US$2.7 million.[5] The cost of in-service teacher training is between US$28.5 and US$38.5 per hour of training (MINEDUC 2016).

In-service training under the SIPROFE program is mandatory for teachers who underperform (that is, teachers with a score lower than 700 points in the test) on the teacher assessment *Ser Maestro*, a test implemented periodically by the National Institute of Evaluation (INEVAL). However, this requirement has not been systematically enforced. Participation in training is optional for all other teachers and school administrators in the public education system. Teachers' participation in these training programs is among one of many criteria considered for career promotion.

In terms of design features, most training programs take place on school premises and outside the teachers' working time (that is, holidays, evenings, and weekends). However, in recent years, training providers have introduced some flexibility in the curricula by providing some content (and thus training hours) online. Also, teachers can take training courses during working hours if they obtain permission from school district authorities. To complete a course, participating teachers need to attend all the required course hours and pass a course evaluation. Also, to promote attendance and completion, the MINEDUC requires that teachers who sign up for a training program and fail the course (due to lack of attendance or if they fail the course exam) pay for the training cost out-of-pocket. Training opportunities are normally communicated to teachers by e-mail when new courses open. The content and curricula of the courses are generally designed between MINEDUC administrators and training providers based on the ministry's identified priorities and the provider's capacity to deliver courses (that is, courses are largely supply-driven). Neither the MINEDUC nor training providers conduct a systematic diagnostic to identify teacher learning needs.

To date, the effectiveness of the SIPROFE program remains largely unassessed. The MINEDUC has not conducted a systematic evaluation of the program and its effects on teacher and student outcomes. There have been some attempts to collect qualitative information to assess the program's effectiveness through interviews and focus groups with teachers and school

---

[5] Moreover, between 2014 and 2017, funds from the SIPROFE were used to support 3,924 teachers in obtaining a master's degree in education.

principals. Nevertheless, most of the information available relies on small samples and cannot be assumed to be representative for statistical inference.

Results from qualitative interviews conducted by Portaluppi Castro (2012) and Fabara-Garzon (2013) show, for instance, that teachers identify several problems with the training courses offered by the SIPROFE program. Focus group participants indicated that the training programs offered under SIPROFE lacked relevance and that courses were theoretical and provided little space for dialogue, analysis, and contextualization. Participants also indicated that there was little follow-up (for example, mentoring, coaching, feedback mechanisms) after training courses were completed. Some participants complained about the quality and pedagogical approaches of the trainers.

On the positive side, participants agreed that the efforts made through the SIPROFE program are a clear signal of the interest of the state in teachers' professional development. Participants also indicated that some teachers participated in the program to be promoted. Finally, participants suggested that the program could be improved by (a) having a better diagnostic of teachers' training needs and offering progress to address them; (b) complementing training courses with more follow-up support, such as coaching and mentoring; (c) making it easier to obtain permission to attend training during working hours; and (d) making courses more interactive, flexible, and relevant to local contexts.

III.   Teacher assessments in Ecuador

The *Ser Maestro* assessment, the government's main instrument to quantify the level of knowledge of Ecuadoran teachers, is implemented by Ecuador's National Institute of Evaluation and is an important pillar of the country's teacher evaluation model. The assessment measures the level of knowledge of teachers in the field they teach, including specific topics they must master to promote an adequate learning process in their subjects. The assessment is applied to all teachers in active service (that is, it is census-based). The last assessment was conducted in 2016.

The assessment includes 19 knowledge areas (*Saberes*) that include subjects spanning Ecuador's three main educational cycles: Early Education (pre-K), Basic General Education (BGE) (grades 1 to 10), and Unified General Baccalaureate (UGB), equivalent to high-school (grades 1 to 3). Each subject includes several "curricular areas," which assess the level of knowledge of the teacher in specific aspects of the national curriculum within the subject matter.

For each operational definition, in turn, the assessment includes a series of questions that make it possible to determine exactly which areas of knowledge teachers have problems with. For example, the information provided by the assessment identifies whether a teacher of mathematics (subject area) in BGE (education cycle) has knowledge gaps on set theory or geometry (curricular areas).

The *Ser Maestro* assessment is applied to teachers according to the subject and grade they teach. Questions in the assessment relate to the main subject teachers teach in the classroom in the academic year of the assessment. Teachers are only assessed on one subject. Generalist teachers in primary schools (grades 2 to 7) are assessed on basic general education. The *Ser Maestro* database includes a variable that provides teachers' total scores in the assessment (scores oscillate between zero and 1,000 points). Teachers with an overall score below 700 points are considered underperformers (that is, they fail the exam). For these teachers, in-service training is mandatory, although, as mentioned, this policy is not systematically enforced. As illustrated in figure 1, a significant share of teachers in BGE and UGB score below the 700 threshold in the assessment.

Figure 1. Distribution of Teacher Performance in the *Ser Maestro* Assessment
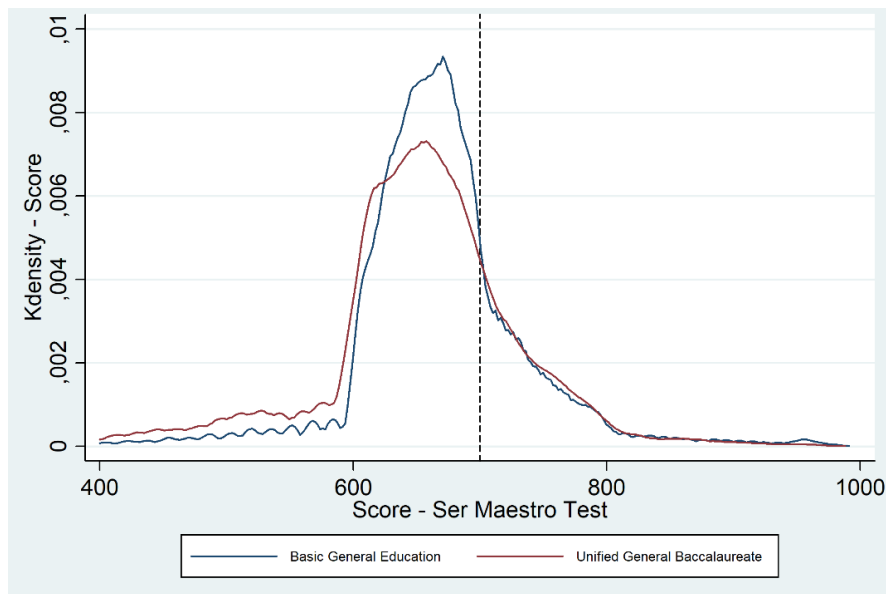
Source: Author using *Ser Maestro* 2016 data.

Based on their scores, teachers can be further classified into four different groups: (a) low-performance teachers, which are those with scores lower than one standard deviation below the mean; (b) low-standard-performance teachers, which are those with scores between the

distribution mean and one standard deviation; (c) high-standard-performance teachers, which are those with scores between the mean and one standard deviation above the mean; and (d) high-performance teachers, which are those with scores above one standard deviation above the mean. Based on these definitions, 6.28 percent of all teachers in Ecuador are classified as being in the low-performance group, 44.45 percent are classified as being in the low-standard-performance group, 38.26 percent are classified as being in the high-standard-performance group, and 11.01 percent are classified as being in the high-performance group.

Assessment results by knowledge topic indicate that a large majority of teachers (50 to 70 percent) underperform in mathematics, Basic General Education, and natural sciences (BGE level), and in mathematics, physics, and biology (UGB level). Overall teacher performance is generally better in subjects that pertain to social sciences and literature (table 1).

Table 1. Knowledge Areas Included in the *Ser Maestro* Assessment, by Education Cycle

	Performance					
	Low (%)	Standard Low (%)	Standard High (%)	High (%)	Total Sample	% Teachers Evaluated in the Subject
General Subjects (all levels)						
Management	6.67	39.28	33.78	20.27	2.235	2.38
Computers	4.84	38.99	42.44	13.73	3.655	3.89
Philosophical thinking	5.74	44.93	29.39	19.93	296	0.32
Artistic education	6.02	38.44	38.35	17.20	1.163	1.24
Special education	6.8	37.62	45.78	9.82	723	0.77
Physical education	6.48	33.72	44.25	15.55	4.102	4.37
Early education	4.44	45.61	41.66	8.30	14.281	15.20
Citizenship education	6.17	42.08	34.95	16.81	827	0.88
Basic General Education (BGE)						
Basic general education (grades 2º–7º)	4.71	47.33	39.02	8.94	41.993	44.69
Natural sciences	8.64	47.94	30.38	13.03	5.056	5.38
Social studies	6.80	34.62	42.69	15.88	4.659	4.96
Language and literature (grades 8º–10º)	5.15	27.38	41.89	25.58	2.991	3.18
Mathematics (grades 8º–10º)	13.97	55.52	23.88	6.64	3.208	3.41
Unified General Baccalaureate (UGB)						
Physics	21.67	51.71	23.38	3.23	526	0.56
History and social sciences	18.10	40.10	31.36	10.43	1.591	1.69
Language and literature	9.01	36.50	37.66	16.83	2.775	2.95
Biology	6.66	47.10	39.33	6.91	811	0.86
Mathematics	16.91	56.49	22.28	4.32	2.271	2.42
Chemistry	7.81	33.25	38.79	20.15	794	0.85
Total	6.28	44.45	38.26	11.01	93.957	100.00

Source: Author using *Ser Maestro* 2016 data.

A most interesting feature of the *Ser Maestro* assessment, as mentioned, is that teachers' knowledge is tested against a series of "curricular areas" within each subject. Such a level of granularity of information enables the identification of very specific knowledge areas where teachers display cognitive gaps. Data from the *Ser Maestro* identify the share of correct and incorrect teacher responses in the assessments. The specificity of this information enables personalized teacher development programs to be designed based on actual needs and knowledge gaps (table 2).

Table 2. Curricular Areas (by Subject) with Low Levels of "Correct" Response Rates

SUBJECT AREA	% of correct answers	Curricular areas where teachers display the lowest performance (by teaching subject)
Management	30.0	1. Identification of the main elements of labor contracts 2. Knowledge of the main elements required for strategic planning
Computers	25.0	1. Characteristics of "data mining"
Philosophical thinking	30.0	1. Identification of aesthetic postulates of emblematic exponents 2. Identification of main characteristics of the Andean cosmovision
Artistic education	35.0	1. Identification of characteristics of technical elements of the arts 2. Identification of characteristics of elements of the arts 3. Identification of genres or plastic expressions
Special education	35.0	1. Identification of characteristics of the components of a curriculum 2. Description of weakened psychological processes
Physical education	40.0	1. Recognition of adequate postures 2. Determination of parameters to assess physical capabilities
Early education	30.0	1. Identification of phonological awareness features 2. Identification of rights and responsibilities of children
Citizenship education	25.0	1. Identification of practices that promote a culture of peace 2. Recognition of the characteristics of citizenship
Basic general education	25.0	1. Set theory 2. Identification of ordered pairs 3. Identification of metabolic processes
Natural sciences BGE	25.0	1. Identification of characteristics of autotrophic organisms 2. Identification of properties of chemical compounds
Social studies BGE	20.0	1. Relationship between humanism and cultural changes 2. Recognition of laws or actors that regulate markets
Language and literature BGE	40.0	1. Recognition of authors' shortcomings after reading a text
Biology UGB	25.0	1. Identification of the main functions of nucleic acids 2. Recognition of hormone functions 3. Identification of different types of aquatic biomes
Mathematics BGE	25.0	1. Geometry 2. Set theory
Physics UGB	15.0	1. Notions of thermodynamics 2. Calculation of physical magnitudes 3. Characterizations of energy
History and social sciences UGB	20.0	1. Recognition of authors of contemporary philosophy 2. Identification of social characteristics from reading texts
Language and literature UGB	30.0	1. Recognition of logical connectors from the reading of a text
Mathematics UGB	20.0	1. Set theory 2. Geometry 3. Notions of cardinality
Chemistry UGB	20.0	1. Identification of types of photovoltaic cells

Source: Author using *Ser Maestro* 2016 data.
Note: BGE = Basic General Education; UGB = Unified General Baccalaureate.

IV. Use of assessments to design in-service training programs

Identification of More Pertinent Training Content

Based on available funding and preestablished yearly training targets, administrators of the SIPROFE program reach out to universities (or other training providers) to have them propose training content. As mentioned, the training curricula for these courses are not based on a systematic assessment of needs, but rather on the university's expertise, the supply of courses, the availability of trainers, and general delivery capacity (that is, courses are supply-driven).

According to data provided by the National Directorate of Continuous Education (a division under the MINEDUC's Undersecretariat of Professional Development), since its introduction in 2008, the SIPROFE program has offered, on average, 15 in-service training courses per year. These training programs are categorized into two main groups: (a) complementary programs, which are largely focused on building the capacity of teachers to revise and update the curricula; and (b) remedial programs, which aim to address teachers' knowledge gaps. Table 3 lists the remedial courses most recurrently offered by the SIPROFE program. Results indicate that courses offered are highly focused on pedagogy and general education, with a limited focus on improving cognitive skills.

Table 3. Remedial Courses Offered under the SIPROFE Program, 2012–16

| Course Name	Training Hours
Pedagogy for Natural Sciences (BGE)	40
Pedagogy for Social Sciences (BGE)	40
Pedagogy for Mathematics (BGE)	40
Pedagogy for promoting critical thinking in the classroom	40
Pre-K education	50
Strategies to evaluate student learning	60
Inclusive education	10
Introduction of information technology and communications	50
Critical reading	60
General pedagogy	60
Prevention of student risks (sexual abuse, violence, etc.)	30

Source: MINEDUC 2016.

Program administrators and participating training providers could use the information of the *Ser Maestro* assessments to make courses more demand-driven and responsive to teachers' observed cognitive skills gaps. As mentioned, the assessment identifies both the subjects and curricular areas where teachers display cognitive deficits. Administrators, for instance, could develop reports using the *Ser Maestro* results that show the observed performance of teachers by

subject and curricular areas at the district level. For example, figure 2 displays (for a selected school district in Ecuador) the average performance of teachers in the district in curricular areas related to the teaching subject literature and language for UGB. A similar exercise could be replicated in other subject areas, such as mathematics for UGB, physics for UGB, and so forth. The figure plots the average percentage of correct answers in a given curricular area for all teachers in the district who currently teach this subject. The red, yellow, and green bars display the subjects on which teachers, on average, correctly answered less than 30 percent of the subject-related questions, between 30 and 35 percent of the subject-related questions, and between 40 to 60 percent of the subject-related questions, respectively. This information could be used by program managers and universities to develop a more pertinent training curriculum that responds to actual knowledge gaps of teachers in a given school district.

A similar exercise using the results of the *Ser Maestro* assessments could be conducted at the school level. The MINEDUC could provide school directors with individualized teacher reports that contain similar information for all schoolteachers. Based on such information, teachers and directors could develop individualized training plans. Since at the district level the supply of services (in partnership with local universities and pedagogical institutes) would also consider the training needs of teachers in the district, teachers and directors could choose from the available courses offered at the district level the best ones that suit the teacher's individual training needs. Of course, adapting the supply of services to the actual needs of teachers would take time. Also, for the process to work, the MINEDUC probably would need to provide technical assistance to school directors to be able to interpret teacher reports and to develop individualized training plans. The MINEDUC could start by testing this model in some school districts (and learn from the experience) before scaling up the model nationally.

Figure 2. Average Percentage of Teacher's Correct Answers by Curricular Area in a Selected School District in Ecuador for Teachers of Literature and Language, UGB
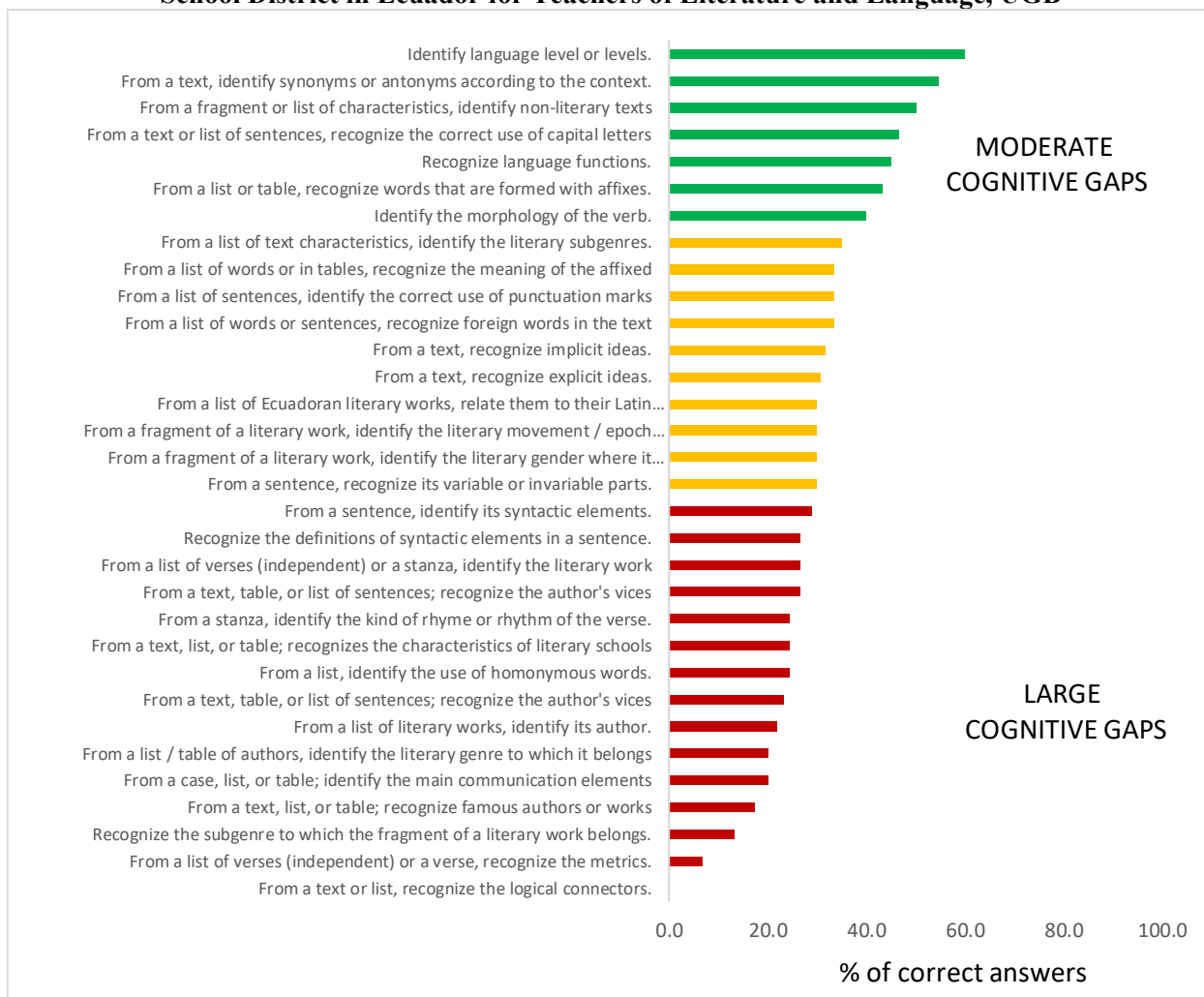
Source: Author using *Ser Maestro* 2016 data.
Note: The red, yellow, and green bars display the subjects on which teachers, on average, correctly answered less than 30 percent of the subject-related questions, between 30 and 35 percent of the subject-related questions, and between 40 to 60 percent of the subject-related questions, respectively.

*Can the results of the Ser Maestro assessments be trusted?*

Using the *Ser Maestro* assessments to guide the content of in-service teacher training could be problematic if the knowledge areas measured by the exam are not necessarily related to the curricula imparted in the classroom. If this were the case, investing in training programs to solve the cognitive skills gaps of teachers may not necessarily translate into better student learning.

Ecuador uses the *Ser Bachiller* assessment, a census-based instrument, to assess student learning. The *Ser Bachiller* assessment is a compulsory exam students take to graduate from the

UGB. The assessment is used by most higher education institutions as the entry exam to access higher education.[6]

Figure 3 plots school-level results of the *Ser Bachiller* (y-axis) and the *Ser Maestro* (x-axis) assessments in the areas of language (panel A) and mathematics (panel B). The panels indicate that schools with better-performing teachers in language and mathematics tend to also have better-performing students in language and mathematics. Moreover, estimates from a simple Ordinary Least Squares regression model indicate that schools having teachers with 10 percent higher average scores in language and mathematics in the *Ser Maestro* assessments are associated with schools with students with 15 percent higher scores in the language and mathematics *Ser Bachiller* assessment (table 4). While these results do not imply causality, they indicate a positive correlation between teacher and student performance in language and mathematics in both assessments. These results provide prima facie evidence that improving teachers' cognitive skills in language and mathematics (proxied by the *Ser Maestro* assessment) is expected to improve the cognitive skills in language and mathematics of the students in the schools they serve (proxied by the *Ser Bachiller* assessment).

Figure 3. Correlation between *Ser Maestro* and *Ser Bachiller* Assessments at the School Level – Language and Mathematics (UGB)
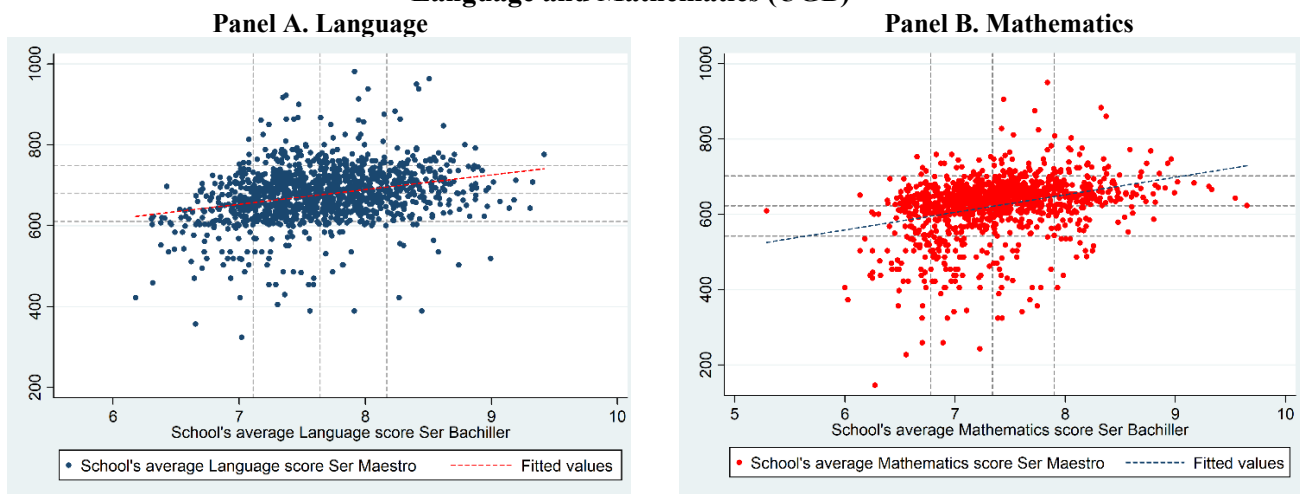
Source: Author using *Ser Maestro* 2016 and *Ser Bachiller* 2017/2018 datasets.

---

[6] The National Institute of Evaluation also uses the *Ser Estudiante* assessment, which is conducted on a sample of BGU students. Not being census-based is an important limitation of this assessment, as it does not enable school-level student performance to be assessed.

Table 4. Correlations between Scores on *Ser Bachiller* and *Ser Maestro* Assessments at the School Level – Language and Mathematics (UGB)

	Language		Mathematics	
	Log score *Ser Bachiller*	Log score *Ser Bachiller*	Log score *Ser Bachiller*	Log score *Ser Bachiller*
Log of score on Ser Maestro	0.186***	0.176***	0.156***	0.152***
	[0.017]	[0.018]	[0.014]	[0.014]
School's total students		0.000		-0.000**
		[0.000]		[0.000]
School's total mathematics teachers				0.007***
				[0.002]
School's total language teachers		0.003*		
		[0.002]		
Constant	0.824***	0.877***	0.995***	1.007***
	[0.113]	[0.116]	[0.089]	[0.089]
Observations	1.271	1.271	1.164	1.164
Adjusted R-squared	0.081	0.086	0.097	0.107

Source: Author using *Ser Maestro* 2016 and *Ser Bachiller* 2017/2018 datasets.
Note: *** = P ≤ 0.001. Standard errors in brackets.

Improving Program Targeting

In-service training opportunities in Ecuador under the SIPROFE program are made available to teachers on a first-come, first-served basis. Once these training opportunities become available, program administrators contact teachers by e-mail or through local campaigns organized by the MINEDUC in coordination with school district authorities. Teachers who want to participate in the available programs sign up until all slots are filled.
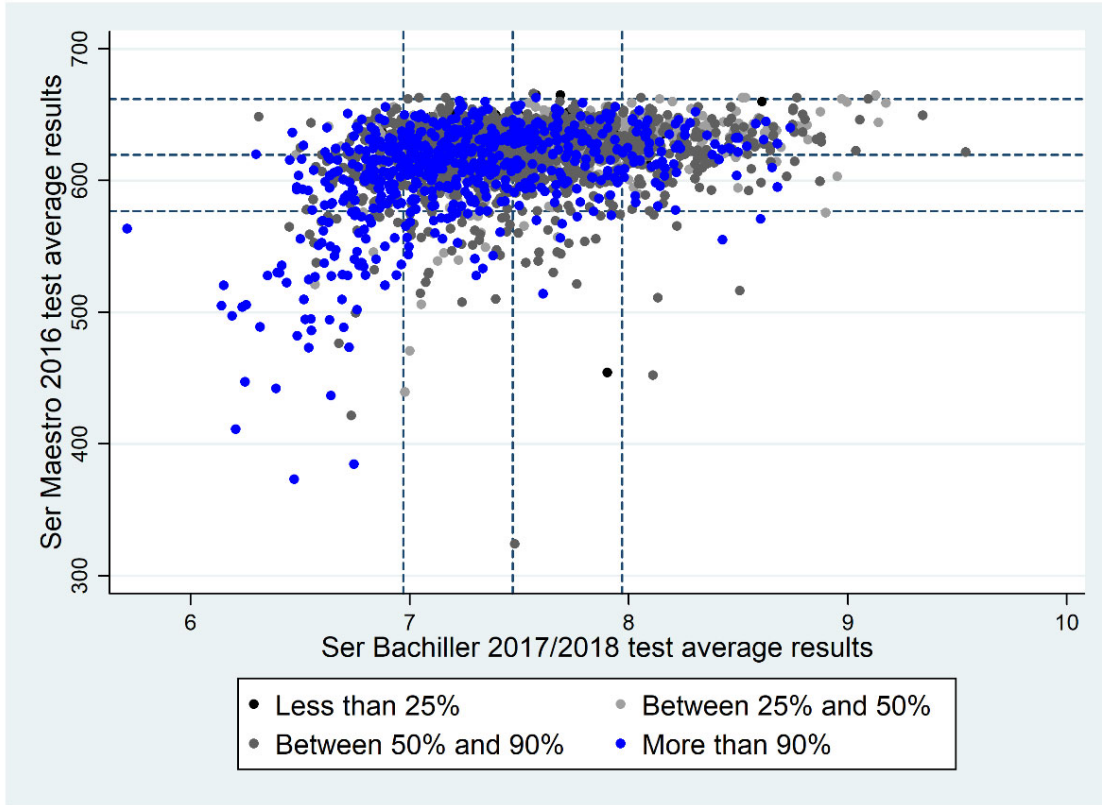
The combined information from the *Ser Bachiller* and the *Ser Maestro* assessments constitutes a powerful tool to target interventions in schools (and school districts) with the largest needs. Figure 4 plots school-level overall results of the *Ser Maestro* (y-axis) and *Ser Bachiller* (x-axis) assessments. The dotted lines in the figure represent test scores that are one standard deviation above and below the average scores. Each dot in the figure represents a school. The color of the dots represents the poverty rates of the parishes (the smallest administrative territorial disaggregation) where schools are located. The blue dots represent the schools located in areas with the highest poverty rates, and the black dots represent the schools located in areas with the lowest poverty rates.[7]

Figure 4 illustrates that schools with the worst-performing teachers also have the worst-performing students (bottom left panel of the chart). While this relationship does not necessarily imply a causality, it contributes to identifying the worst-performing institutions, presumably those

---

[7] Poverty is measured by the (census-based) Unsatisfied Basic Needs Index produced in 2010 by Ecuador's National Office of Census and Statistics.

where teachers and students can benefit the most from available (and limited) government interventions, such as in-service training programs.

Figure 4. Student Performance compared to Teacher Performance on Standardized Tests, by School

Thus, collecting information from the worst-performing schools and school districts in the *Ser Bachiller* and the *Ser Maestro* assessments could be used to target the school districts with the greatest needs. As an illustration, table 5 provides a list of the school districts that display the worst performance in both assessments. The MINEDUC could consider targeting interventions under the SIPROFE program to these districts. Other targeting criteria and additional filters could be added in the process (such as proximity to training providers, local poverty rates, and school size). In any case, the main idea behind these results is that Ecuadoran policy makers could use their available assessment data to target in-service teacher training interventions to the student and teacher populations with the greatest needs.

Table 5. Education Districts with Average Scores in the *Ser Maestro* and *Ser Bachiller* Assessments that are Below One Standard Deviation from the Mean

District ID	Number of Schools	% Schools	Province	Region	*Ser Bachiller* Average Score	*Ser Maestro* Average Score
21D02	2	2.33	Sucumbíos	Amazonía	6.70	484.38
14D05	8	9.30	Morona Santiago	Amazonía	6.23	497.28
16D02	4	4.65	Pastaza	Amazonía	6.53	497.31
13D01	1	1.16	Manabí	Costa	6.75	499.50
21D04	5	5.81	Sucumbíos	Amazonía	6.65	500.96
19D01	1	1.16	Zamora Chinchipe	Amazonía	6.52	509.60
16D01	9	10.47	Pastaza	Amazonía	6.53	512.91
15D01	7	8.14	Napo	Amazonía	6.74	520.99
06D01	1	1.16	Chimborazo	Sierra	6.57	521.00
14D01	1	1.16	Morona Santiago	Amazonía	6.35	527.70
09D20	1	1.16	Guayas	Costa	6.94	528.00
08D02	4	4.65	Esmeraldas	Costa	6.60	528.67
08D04	3	3.49	Esmeraldas	Costa	6.75	530.48
14D02	4	4.65	Morona Santiago	Amazonía	6.51	532.68
08D03	2	2.33	Esmeraldas	Costa	6.60	536.65
14D03	4	4.65	Morona Santiago	Amazonía	6.60	537.36
08D01	7	8.14	Esmeraldas	Costa	6.76	541.35
22D01	2	2.33	Orellana	Amazonía	6.80	543.06
09D02	1	1.16	Guayas	Costa	6.83	545.67
22D02	7	8.14	Orellana	Amazonía	6.76	547.01
21D03	1	1.16	Sucumbíos	Amazonía	6.56	552.50
13D07	1	1.16	Manabí	Costa	6.60	552.67
08D06	2	2.33	Esmeraldas	Costa	6.76	555.42
05D04	1	1.16	Cotopaxi	Sierra	6.80	555.60
08D05	1	1.16	Esmeraldas	Costa	6.93	556.25
09D11	1	1.16	Guayas	Costa	6.61	561.60
12D06	1	1.16	Los Ríos	Costa	6.76	562.17
21D01	1	1.16	Sucumbíos	Amazonía	6.45	564.67
12D01	1	1.16	Los Ríos	Costa	6.95	568.00
19D02	1	1.16	Zamora Chinchipe	Amazonía	6.84	572.80
09D06	1	1.16	Guayas	Costa	6.79	575.94
Total	**86**	**99.97**				

Source: Author using *Ser Maestro* 2016 and *Ser Bachiller* 2017/2018 datasets.

V. Conclusion

Teacher performance constitutes a critical determinant of student learning. As such, continuous contact with poor-performing teachers over several years could result in significant learning gaps. In Ecuador, evidence indicates that children in poor localities face significant risks of being taught by teachers who do not master the curricula of the class they teach. Results from teacher assessments indicate that a large majority of teachers underperform in mathematics, Basic General Education, and the natural sciences (BGE level), and in mathematics, physics, and biology (UGB level). Given the fact that many teachers in Ecuador enter the education system with important cognitive gaps, in-service teacher training could be an important tool to strengthen teacher performance.

Ecuador in recent years has made important investments in improving teacher development and quality. Since 2008, the MINEDUC has been promoting in-service teacher training through its Comprehensive System for the Development of Education Professionals (SIPROFE) program. Since 2010, the SIPROFE program has delivered in-service teacher training to about 75 percent of Ecuador's total teacher population. Nevertheless, training programs delivered under the SIPROFE program have been supply-driven, focused on improving pedagogy, and not necessarily designed to respond to the observed teacher's cognitive skills gaps. Moreover, their effectiveness has been largely unassessed, and program targeting has not prioritized school districts where teacher development programs are needed the most.

Ecuador currently uses teacher and student assessments that can identify in detail the cognitive deficiencies of students and teachers. These data, however, have not been used to guide the design of in-service teacher training programs. Ecuador's teacher assessment (*Ser Maestro*) evaluates teachers on the subjects they teach in the classroom and identifies curricular areas within a teaching subject where teachers display cognitive gaps. The specificity of this information enables personalized development programs to be designed based on teachers' actual needs. Program administrators and participating training providers could use this information to develop a more pertinent training curriculum that addresses the knowledge gaps of teachers across different school districts.

Furthermore, combining available information on student and teacher assessments would allow policy makers in Ecuador to identify the worst-performing schools. Given that resources to provide in-service training opportunities are limited, the government could use this information to

target interventions to schools with the greatest needs. SIPROFE administrators could use these assessment results plus other information; such as proximity to training providers, local poverty rates, and school size; in their yearly programming, which targets selected territories nationwide.

The results of the *Ser Maestro* assessments could also serve to develop diagnostics for schools and teachers. The MINEDUC could provide school directors, teachers, and parents with individualized reports that contain information about observed cognitive gaps. Based on such information, teachers and school principals could develop individualized training plans for schools and teachers. Using available information from student and teacher assessments, thus, could become a key input for policy makers in countries that use such information, such as Ecuador, to develop more pertinent and effective teacher development programs. Since more countries are periodically conducting student and teacher assessments, the recommendations presented here for Ecuador could well be taken into consideration regionally and globally.

Of course, the process of adapting the supply of training services to the actual needs of teachers (and to local needs) takes time. However, Ecuador, as well as many other countries in the region, could consider using available evaluations to design and implement in-service training programs of higher relevance and impact while allowing the prioritization of investments in teachers and students with the greatest needs.

Bibliography

Angel-Urdinola, D., and P. Vera-Jibaja. 2018. *Achievements and Challenges of Ecuador's Education Sector in the 21st Century.* World Bank. Washington, DC. https://ssrn.com/abstract=3180271 or http://dx.doi.org/10.2139/ssrn.3180271.

Avalos, B. 2007. "Teacher Continuous Professional Development: What the international and Latin American experiences tell us." *Pensamiento Educativo* 41 (2): 77–99.

Bruns, B., and J. Luque. 2014. *Great Teachers: How to Raise Student Learning in Latin America and the Caribbean*. Washington, DC: World Bank.

Chetty, R., J. N. Friedman, and J. E. Rockoff. 2014. "Measuring the Impacts of Teachers II: Teacher Value-Added and Student Outcomes in Adulthood. *American Economic Review* 104 (9): 2633–2679.

Fabara-Garzon, E. 2013. "Estado del Arte de la Evaluación Docente en Ecuador." *Cuadernos del Contrato Social por la Educación*. Cuaderno No. 8. Quito, Ecuador.

Figlio, D., and L. Kenny. 2007. "Individual teacher incentives and student performance." *Journal of Public Economics* 91 (5–6): 901–914.

Fryer, Jr., R. G. 2017. "The Production of Human Capital in Developed Countries: Evidence from 196 Randomized Field Experiments." In *Handbook of Economic Field Experiments*, Vol. 2. Amsterdam: North-Holland, pp. 95–322.

Gersten, R., M. J. Taylor, T. D. Keys, E. Rolfhus, and R. Newman-Gonchar. 2014. *Summary of research on the effectiveness of math professional development approaches*. Department of Education and Regional Educational Laboratory, Southeast at Florida State University, Washington, DC, and Tallahassee, Florida. http://files.eric.ed.gov/fulltext/ED544681.pdf.

Hanushek, E., and L. Woessmann. 2006. "Does educational tracking affect performance and inequality? Differences-in-differences evidence across countries." *Economic Journal* 116 (510): C63–C76.

Hanushek, E., M. Piopiunik, and S. Wiederhold. Forthcoming. "The Value of Smarter Teachers: International Evidence on Teacher Cognitive Skills and Student Performance." *Journal of Human Development*.

Hanushek, E., P. Peterson, and L. Woessmann. 2012. *Achievement Growth: International and U.S. State Trends in Student Performance*. Harvard's Program on Education Policy and Governance / Education Next. Harvard Kennedy School, Cambridge, MA.

Hanushek, E. A., and S. G. Rivkin. 2010. *Using value-added measures of teacher quality*. (CALDER Brief 32 No. 9). National Center for Analysis of Longitudinal Data in Education Research, Washington, DC. http://files.eric.ed.gov/fulltext/ED509683.pdf.

Harvey, J. 2016. "Understanding Ecuador's Education Reform: A Case Study of 2006–2015." Concordia University, Portland, Oregon.

Ingersoll, R. 2004. "Why Do High-Poverty Schools Have Difficulty Staffing Their Classrooms with Qualified Teachers." University of Pennsylvania, Philadelphia.

Levy, S., and N. Schady. 2013. "Latin America's Social Policy Challenge: Education, Social Insurance, Redistribution." *Journal of Economic Perspectives* 27 (2): 193–218.

MINEDUC (Ministry of Education). 2016. *Proyecto Sistema Integral De Desarrollo Profesional Educativo* – SIPROFE. Reporte de Gestión 2010–2015. Ministry of Education, Quito.

Moura-Castro, C., and G. Ioschpe. 2007. *La remuneración de los maestros en América Latina: ¿Es baja? ¿Afecta la calidad de la enseñanza?* Programa de Promoción de la Reforma Educativa en América Latina y el Caribe Partnership for Educational Revitalization in the Americas (PREAL No. 37). Canadian Institute for Non-destructive Evaluation (CINDE), Santiago, Chile, and Inter-American Dialogue, Washington, DC.

Mulford, B., D. Kendall, J. Ewington, B. Edmunds, L. Kendall, and H. Silins. 2008. "Successful principalship of high-performance schools in high-poverty communities." *Journal of Educational Administration* 46 (4): 461–480.

Muralidharan, K., and V. Sundararaman. 2011. "Teacher performance pay: experimental evidence from India." *Journal of Political Economy* 119 (1): 39–77.

OECD (Organisation for Economic Co-operation and Development). 2009. "The Professional Development of Teachers." In *Creating Effective Teaching and Learning Environments.* Paris: Organisation for Economic Co-operation and Development. ISBN 978-92-64-05605-3.

Popova, A., D. Evans, M. E. Breeding, and V. Arancibia. 2018. "Teacher Professional Development around the World: The Gap between Evidence and Practice." Policy Research Working Paper No. 8572, World Bank, Washington, DC.

Portaluppi Castro, C. 2012. *El Sistema Integral de Desarrollo Profesional Educativo (SíPROFE): Una mirada desde los involucrados en el sistema.* Trabajo Final para la obtención del Título de Magíster en Educación Superior, con mención en Temas Contemporáneos en Docencia Superior. Universidad Casa Grande, Guayaquil, Ecuador.

Rivkin, S. G., E. Hanushek, and J. F. Kain. 2005. "Teachers, Schools, and Academic Achievement." *Econometrica* 73 (2): 417–458.

Rockoff, J. E. 2004. "The Impact of Individual Teachers on Student Achievement: Evidence from Panel Data." *American Economic Review* 94 (2): 247–52.

Walter, C., and J. Briggs. 2012. *What professional development makes the most difference to teachers.* Oxford: University of Oxford Department of Education. http://clie.org.uk/wpcontent/uploads/2011/10/Walter_Briggs_2012.pdf.

Woessmann, L. 2011. "Cross-country evidence on teacher performance pay." *Economics of Education Review* 30 (3): 404–418.