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School leadership and school quality in secondary education in Rwanda

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About Laterite and the REAL Centre:

Laterite is a data, research and advisory firm dedicated to bringing high-quality research services to the most underserved markets. Based in East Africa, the firm strives to carry out impactful research that helps decision-makers find solutions to complex development problems.

The REAL Centre at the University of Cambridge pioneers research into overcoming barriers to education, such as poverty, gender, ethnicity, language and disability, and promotes education as an engine for inclusive growth and sustainable development.

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Table of contents

Acronyms

CPD	Continuous Professional Development
ESSP	Education Sector Strategic Plan
HII	Herfindahl-Hirschman Index
NSIR	National Institute of Statistics Rwanda
REAL	Research for Equitable Access and Learning
REB	Rwanda Basic Education Board
S3	Secondary 3
STEM	Science, technology, teaching and mathematics
URCE	University of Rwanda College of Education

The context

Strengthened school leadership is one of Rwanda's strategic priorities to improve the quality of education. The Education Sector Strategic Plan (ESSP) 2018/19 to 2023/24 (Rwandan Ministry of Education, 2019) for Rwanda includes the strategic priority to *strengthen governance and accountability across all levels of education in Rwanda*, with the targeted outcome of *improved leadership in schools*. While recognising that Rwanda's head teachers currently "largely play an administrative role", the document highlights the impact of school leadership on student learning and school quality, and the key role of school leaders in supporting and advising teachers. With these objectives in mind, the ESSP aims to increase the number of school leaders who are trained and mentored in leadership.

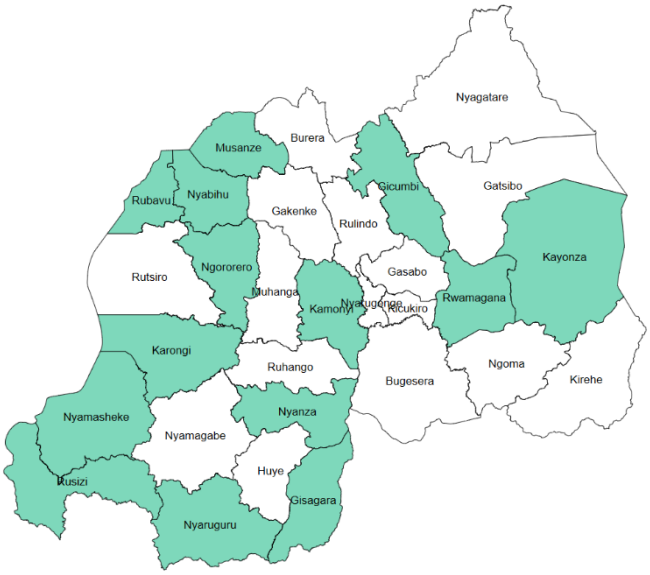
Progress and actions to achieve these objectives are already underway in Rwanda. Cheriyan et al. (2020) report that, in 2017, 87% of school leaders had received training specifically designed for their roles. Furthermore, the authors show that those who have received this training provided frequent feedback and conducted evaluations of teachers at their schools. Launched in 2019, the Mastercard Foundation's Leaders in Teaching initiative includes a Continuous Professional Development (CPD) program for school leaders organised by VVOB Rwanda and University of Rwanda College of Education (URCE). Another example is the work of the school leadership management unit of the Rwanda Basic Education Board (REB).

An effective way of supporting efforts to meet Rwanda's objectives regarding school leadership is by using evidence-based findings from the extant literature. School leadership's impact on school and teaching quality, as well as learning outcomes, is widely documented in the international literature (see, for example, reviews of Hallinger and Heck, 1998 or Bell et al., 2003). Unfortunately, there is scant research on school leadership and how it relates to school quality in low- and lower-middle-income countries, and even less research available in sub-Saharan Africa. Further, related research in the context of Rwanda is largely missing.

The study

This paper has been prepared as part of Leaders in Teaching initiative. Laterite and the Research for Equitable Access and Learning (REAL) Centre at the University of Cambridge, are learning partners on the initiative, working with selected education organisations in Rwanda to generate robust qualitative and quantitative evidence to improve teaching quality across the country. This paper uses baseline data collected by Laterite for Leaders in Teaching in February and March 2020 from 358 schools within 14 districts (see Figure 1). In particular, the study draws on responses from 350 school leaders (head teacher or Director of Studies).

Figure 1: Map of the Leaders in Teaching initiative districts



This paper explores whether leadership practices are associated with school quality measures in the Rwandan context.

This paper examines school leadership in Rwanda through five dimensions. We use the five professional standards for effective school leaders developed by REB as a contextualised framework for our measures of leadership practices (see Table 1). Those standards include (i) creating a strategic direction for the school; (ii) leading learning; (iii) leading teaching; (iv) managing the school as an organisation and (v) working with parents and the wider community.

We define measures of school quality and examine how they vary with different leadership practices. Taking our lead from literature on school quality measurement (see, for example, Ladd and Loeb, 2013), we select proxies within our survey data to explore three main dimensions of school quality: *leaders and teachers' satisfaction with available equipment* is our measure of school inputs, *proportion of science, technology, engineering and mathematics (STEM) teachers with a Bachelor education* is our proxy for teaching quality, and *STEM examination passing rates* is intended to reflect students' learning outcomes.

All associations listed throughout this paper are simple correlations and should not be interpreted as representing causality.

The paper is organised as follows: in the first section, we examine school leaders' personal and professional backgrounds. In the second section, we present the three school quality proxies used and the methodological approach of this paper. In the third and final section, we investigate school leadership practices through the lens of the

REB school leadership standards and examine how they are associated with our measures of school quality.

Key findings

- **Our findings sketch an overview of typical practices of Rwandan school leaders.** Establishing a school improvement plan seems to be standard. Most school leaders meet teachers once a month and with parents once a term, and they provide CPD to their staff and use a variety of assessment methods every month. Yet, school leaders report low satisfaction with respect to cooperation with parents.
- **Leadership practices vary with roles.** Directors of Studies are younger and less experienced in leadership than head teachers. They seem to specialise in a few tasks, notably related to teaching and curriculum and interactions with students, whereas head teachers allocate their time more evenly across a variety of tasks.
- **Only one out of five school leaders is a woman**. We found only a few differences in school leadership practices between men and women, although female school leaders tend to meet and provide CPD less frequently than male school leaders. They also report lower satisfaction regarding cooperation with parents.
- **Boarding schools emerge as a specific group of schools** which concentrate more qualified teaching staff, well-performing students and above average satisfaction with school inputs. Additionally, leaders of boarding schools differ from leaders of day schools in many aspects: they are older, more experienced in school leadership, and live closer to their schools. They report lower teacher absenteeism and lateness. Leaders of boarding schools meet with teachers more frequently and report much higher satisfaction regarding cooperation from parents.
- **Of the three school quality measures we define, learning outcomes shows the most associations with school leadership practices**. Higher STEM examination passing rates are associated with diversified leadership—that is, with leaders spending time on a variety of tasks, and not mainly focusing on administrative and leadership aspects. In particular, higher learning outcomes are associated with school leaders' frequent interactions with teachers, through meetings and CPD, and quality engagement with parents.
- **Future research on school leadership quality in Rwanda could focus on finetuning measures of school quality and exploring other practices**.

Table 1: REB school leadership standards and dimensions explored in the study

Standards	Short description	Dimensions explored in this paper
Creating a strategic direction for the school	An effective school leader involves members of the school community and stakeholders (students, staff, parents, local leaders and development partners) in setting and working towards achieving a shared school vision and mission.	Participation in the preparation of a school improvement plan.
Leading learning	The school leader ensures that students have the opportunity for effective learning within a conducive, safe and inclusive environment that is refined continuously to improve instruction for all students.	Share of time spent on curriculum- and teaching-related tasks, and share of time spent interacting with students; Frequency of use of various assessment methods (classroom observations, checking the teacher's lesson plan, the student notebooks and test results).
Leading teaching	An effective school leader supports teachers through ongoing, actionable feedback and needs-based professional development to ensure that rigorous, relevant and evidence-based teaching and authentic learning experiences meet the needs of all students and are in line with Competence Based Approach.	Frequency of meetings with teachers; Provision of CPD to their staff, and frequency of CPD provided.
Managing the school as an organisation	An effective school leader manages the organisation, operations, and facilities in ways that maximise the use of resources to promote a safe, efficient, legal, and effective learning environment.	Share of time spent on administrative and leadership tasks; Frequency of teachers being late or absent;
Working with parents and the wider community	An effective school leader practices two-way communication and use appropriate communication and collaboration skills to accomplish school and system goals by building and maintaining relationships with students, teachers, parents, and the community.	Share of time spent interacting with caregivers and with the community, businesses, and industries. Frequency of discussion with parents over children's learning; Satisfaction with level of cooperation from parents.

1. Who are LIT secondary school leaders in Rwanda?

Descriptive statistics described below are summarised in Table 2. Differences we comment on are statistically significant unless otherwise specified.

School leaders described throughout this paper are either head teachers or Directors of Studies. In each sampled school, the Director of Studies, who acts as a deputy head teacher, was surveyed whenever the head teacher (most senior school representative) was not available. As a result, 57% of school leaders interviewed were head teachers, and 43% were Directors of Studies (see Table 2). Responsibilities differ between the two roles:

- *Head teachers* are typically responsible for the smooth management of the school, the academic achievement of its pupils and the management of its staff;
- *Directors of Studies* are responsible for the academic management of the school and ensuring the teaching and learning components of the curriculum are delivered to the highest standard.[1]

In the remainder of this paper, we account for this difference in roles by exploring differences in school leadership practices between the two positions (see methodological approach section).

Less than one out of five Leaders in Teaching school leaders are women (19%). This ratio of one female for every four male leaders is consistent with Cheriyan et al.'s (2020) findings. Women are more represented among Directors of Studies than among head teachers (23% compared to 17%). In the remainder of this paper, we also explore differences in school leadership practices across gender (see methodological approach section).

An estimated 7% of school leaders report having a disability. Most cases of disability were related to vision problems (19 out of 24 cases). Female school leaders and head teachers are more likely to report a disability than men and Directors of Studies, respectively: 15% of female school leaders and 10% of head teachers in the sample reported a disability, compared to 5% of male school leaders and 3% of Directors of Studies.

[1] According to the presidential order No 064/01 of 16/03/2020, establishing special statutes governing teachers in nursery, primary, secondary and technical and vocational schools, both are *appointed among teachers, at the country level, by a Committee that is composed by experts from the Ministry in charge of education and the City of Kigali or the District, when fulfilling the following requirements: 1° he or she is at least in the third (second for Directors of Studies) category of teachers in the respective level of formal education he or she is working in; 2° he or she has outstanding performance; 3° he or she has integrity; and 4° he or she has outstanding professional ethics.*

An estimated 40% of school leaders do not live in the sector[2] of their school. On average, it takes leaders 25 minutes to commute to their schools. Head teachers and male leaders are more likely to use their own vehicle, whereas female leaders and Directors of Studies are more likely to walk to their school (see Table 2), which could indicate a revenue gap.

School leaders are approximately 43 years old on average, with significant experience in education. Although the difference in the average age of male and female leaders is not statistically significant, Directors of Studies tend to be significantly younger than head teachers, at 40.4 years compared to 44.2 years. On average, school leaders have 15.7 years of experience in education, with differences both between males (16.1 years) and females (14.1 years) as well as between head teachers (16.6 years) and Directors of Studies (14.5 years).

A majority of Directors of Studies have only filled this position in their current school. On average, school leaders have 8.9 years of school leadership experience, with female leaders and Directors of Studies less experienced on average than men (7.8 compared to 9.2 years for men) and head teachers (7.1 compared to 10.2 years for head teachers), respectively. The majority of Directors of Studies (62%) do not have leadership experience in any other school, compared to 29% of head teachers. The turnover of leaders is high, with 21% reporting that they recently joined their school (i.e. within the year).

A significant proportion of school leaders have limited teaching experience. Although 29% of leaders have teaching obligations, a significant proportion have limited teaching experience: more than a third of school leaders have 2 years of teaching experience or less, and 17% have no teaching experience. An estimated 28% of female school leaders had no prior experience as teachers, compared to 14% of male school leaders. On average, leaders have 5.9 years of teaching experience, with Directors of Studies being more experienced in teaching than head teachers (6.6 years, compared to 5.4 years). Female school leaders had an average of 4.8 years of experience as teachers, compared to 6.2 years for male teachers.

Initial school leadership training received by school leaders differs across positions. Head teachers are more likely than Directors of Studies to report receiving initial administrative (86% compared to 69%) and leadership (85% compared to 77%) training. Less common, mentoring and STEM teaching-related training was provided to 61% and 45% of school leaders, respectively.

[2] Rwanda is composed of two layers of government - central and local government, and six administrative entities. The country is divided into Provinces and the City of Kigali, Districts, Sectors, cells and villages.

Leaders of boarding schools differ from leaders of day schools in many aspects

Leaders of boarding schools live closer to their schools than other school leaders. Our sample includes 50 boarding schools. A majority (64%) of boarding school leaders live within the cell[2] of their school, compared to 37% of leaders of day schools. This is consistent with the fact that they are also more likely to walk to their school (70% of leaders of boarding schools, compared to 50% of leaders of day schools) and have significantly lower transportation time (on average 12 minutes compared to 27 minutes for leaders of day schools).

Leaders of boarding schools are older and more experienced in leading a school than leaders of day schools. On average, boarding school leaders are 45 years old and have been leaders for 10.1 years (compared to 42 years old and 8.7 school leadership years for leaders of day schools, respectively). They are less likely to be new to their current school as well (14% of them, compared to 22% among leaders of day schools): on average, they have 6 years of experience leading their current school compared to 4 for leaders of day schools, suggesting that boarding schools are characterised by a lower leader turnover.

Leaders of boarding schools tend to have fewer years of teaching experience than other school leaders and yet are more likely to teach. Leaders of boarding schools do not differ statistically significantly from other leaders regarding initial leadership training they received. However, one out of every four boarding school leaders has no teaching experience, compared to 16% of leaders of day schools. Yet, 42% of boarding school leaders have teaching obligations, compared to 27% of day school leaders.

Table 2: School leaders personal and professional characteristics – descriptive statistics

	All	Male	Female	Δ	Director of Studies	Head teacher	Δ	Day school	Boarding school	Δ
Head teacher	58%	**60%**	**50%**	*				57%	62%	
Female	19%				**17%**	**23%**	*	20%	14%	
Have a disability	7%	**5%**	**15%**	***	**3%**	**10%**	***	6%	12%	
Live outside the school sector	40%	39%	44%		**35%**	**43%**	*	**43%**	**22%**	***
Travel time to work (mins)	25.1	24.7	26.8		**29.7**	**21.7**	***	**27.2**	**12.2**	***
Travel with own vehicle to work	18%	22%	0%		**10%**	**24%**	***	19%	12%	
Walk to work	53%	55%	47%		**60%**	**48%**	**	**50%**	**70%**	***
Age (years)	42.6	42.7	42.2		**40.4**	**44.2**	***	**42.2**	**45.3**	**
Experience in education (years)	15.7	**16.1**	**14.1**	**	**14.5**	**16.6**	***	15.5	16.7	
Experience as a teacher (years)	5.9	**6.2**	**4.8**	*	**6.6**	**5.4**	**	6.1	5.0	
Experience as a school leader (years)	8.9	**9.2**	**7.8**	**	**7.1**	**10.2**	***	**8.7**	**10.1**	**
Recently joined their school	21%	21%	18%		18%	23%		**22%**	**14%**	*
No leadership experience in another school	43%	42%	47%		**62%**	**29%**	***	43%	42%	
Has teaching obligations	29%	29%	29%		31%	27%		**27%**	**42%**	**
No teaching experience	17%	**14%**	**28%**	***	19%	15%		**16%**	**24%**	**
Has completed:										
School administration training	79%	**81%**	**71%**	**	**69%**	**86%**	***	80%	74%	
School leadership training	82%	83%	78%		**77%**	**85%**	**	82%	80%	
Mentoring/coaching training	61%	62%	54%		59%	63%		61%	62%	
STEM Teaching training	45%	46%	41%		**52%**	**40%**	**	47%	36%	
None of the above	13%	12%	16%		14%	11%		13%	10%	

Note: for each breakdown, we conducted a logistic regression analysis to test for statistically significant differences. Statistically significant differences are displayed in bold in the table with statistical significance level in the next column denominated by Δ (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

2. Defining three measures of school quality

In this paper, we approach the concept of school quality by exploring three dimensions: student outcomes, school inputs and teaching quality.[3]

School-level STEM examination passing rate is our proxy for student outcomes. To capture student outcomes within each school, we use the average percentage of Secondary 3 (S3) students who passed STEM examinations in 2019 (reported by 299 school leaders out of 350) as a proxy. This means that we compute the average of the four STEM passing rates (Physics, Chemistry, Maths and Biology).[4] On average, 48% of S3 students passed the STEM examinations.

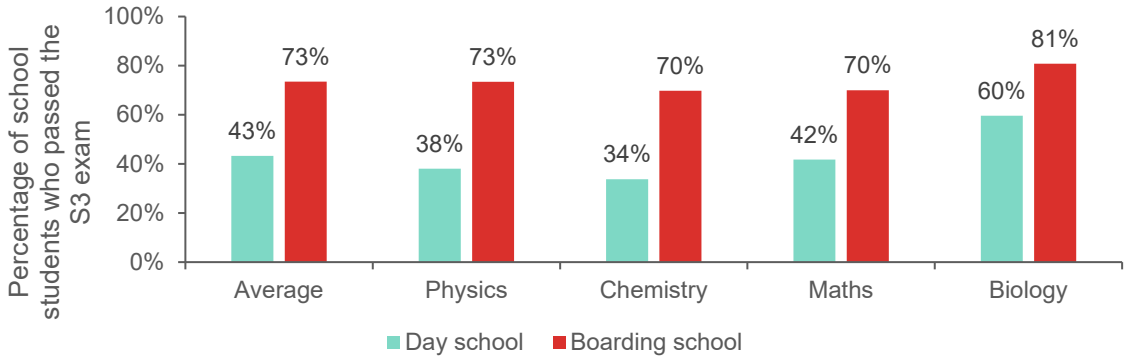
We capture school inputs through reported satisfaction with available equipment. Our proxy for the quality of school inputs considers leaders' and STEM teachers' satisfaction with the amount of equipment and teaching aids they have access to in the school for supporting student learning. We compute the average of the school leader and STEM teacher satisfaction using a Likert-format scale re-scaled from 0 to 4.[5] The average is 1.2, which is slightly above dissatisfied.

STEM teachers' educational background is used as a proxy for teaching quality. To capture information about teacher qualifications within each school, we use the share of STEM teachers with at least A0 level of education (a Bachelors' degree or equivalent) as a proxy.[6] On average, 58% of STEM teachers in secondary schools have an A0 level of education, in line with 56% reported in Laterite 2019, which used 2017 data.

Boarding schools typically perform well on all dimensions of school quality. Leaders of boarding schools are more likely than are leaders of day schools to be satisfied (30% compared to 13%) and less likely to be strongly dissatisfied with school inputs (8% compared to 23%). Nearly 4 out of 5 STEM teachers have A0 education in boarding schools (79%), compared to just above 1 in 2 STEM teachers in day schools (see Table 3). STEM examination passing rates are statistically significantly higher in boarding schools than in day schools (see Figure 2).

[3] See for example Ladd and Loeb 2013.
[4] As opposed to the share of Secondary 3 students that passed all four STEM examinations.
[5] A 5-point scale characterised by 0: strongly disagree; 1: disagree, 2: neither disagree nor agree; 3: agree; and 4: strongly agree.
[6] Teacher qualifications are widely used in the literature as proxy for teaching quality. Moreover, Carter et al. (2021) found that most Rwandan school stakeholders believe that teachers' level of education is an attribute of teaching quality.

Figure 2: Average STEM examination passing rates by type of school



While there are no differences in leadership measures across types of schools, boarding schools emerge as a specific group of schools which concentrate teaching staff with higher education, better satisfaction with school inputs, and better performing students (see, for example, Williams 2019). Therefore, the day/boarding variable is used as a control variable in all analyses of school resources, and student learning outcomes as dependent variables (see methodological approach section).

The school leader's gender is not associated with any of these three measures of school quality. We found no statistically significant difference in satisfaction with equipment, share of qualified STEM teachers or STEM passing rates according to the school leader gender (see Table 3).

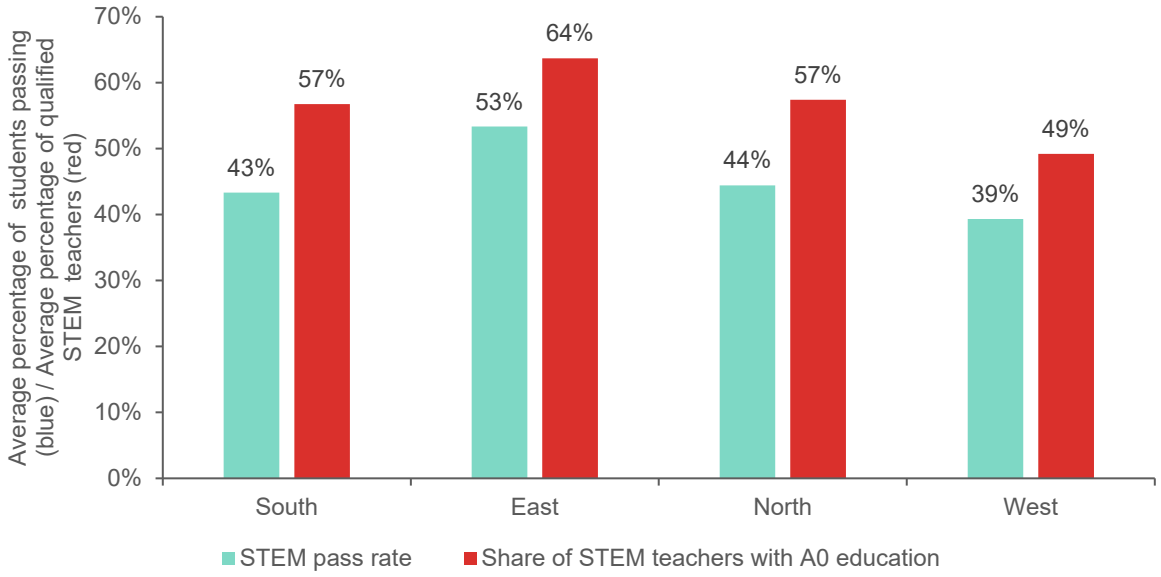
Table 3: School quality measures - descriptive statistics

	All	Male	Female	Day school	Boarding school
Satisfaction with equipment (both)	1.2	1.2	1.2	**1.1**	**1.8**
Satisfaction with equipment (leaders)	2.2	2.2	2.2	**2.1**	**2.6**
Satisfaction with equipment (STEM teachers)	2.2	2.2	2.3	**2.1**	**3.0**
Share of teachers with A0 level	58%	58%	58%	**54%**	**79%**
STEM school passing rate (%)	48	48	47	**43**	**73**
Physics school passing rate (%)	43	44	42	**38**	**73**
Chemistry school passing rate (%)	39	40	37	**34**	**70**
Math school passing rate (%)	46	46	45	**42**	**70**
Biology school passing rate (%)	63	63	62	**60**	**81**

Note: for each breakdown, we conducted an independent samples t-test to detect statistically significant differences. Statistically significant differences (at the 0.001 level) were only found for the 'type of school' breakdown (i.e. day or boarding) and are displayed in bold in the table. Note satisfaction is measured on a scale from 0 to 4, with 0 being very dissatisfied.

We also observe regional differences in school quality measures. Secondary schools from the Eastern province seem to benefit from a higher share of qualified teachers, with 67% of STEM teachers who completed an A0 level of education, compared to 53% in schools of the Western province (this difference is statistically significant). Similarly, the average STEM pass rate in 2019 was 57% in the Eastern province, compared to 43% for schools in the Western province.[7] For this reason, school province is included in the set of control variables in the remainder of our analysis (see methodological approach section). These differences partly account for the higher number of schools and districts included in the Western province, and for the presence of urban districts in the Eastern (Rwamagana, Kayonza) and Western (Musanze) provinces. Note that no statistically significant difference was found between provinces in terms of satisfaction with equipment.

Figure 3: Average school STEM examination passing rate and share of qualified STEM teachers by region



Methodological approach

For the remainder of this paper, we explore how each of the three previously introduced school quality scales varies as a function of various school leadership practices. For this purpose, we use an ordinary least squares regression model and use a school quality scale as the dependent variable (left-hand side) and a school leadership practice as the explanatory variable (right-hand side). We introduce four control variables, gender, school leader position (head teacher or director of studies), boarding school and province dummies (the Western province is omitted), to test any difference in the way leadership practices affect school quality, as follows:

[7] Note that the province of Kigali is not included in the sample.

$$Quality\ measure = \alpha + \beta X + \gamma_1 * gender + \gamma_2 * position + \gamma_3 * boarding$$
$$+\gamma_4 * East\ province\ + \gamma_5 * North\ province + \gamma_6 * South\ province + \epsilon$$

Only statistically significant associations are commented on throughout the analyses, and a selection of regression results is displayed at the end of the paper. Table 4 shows the results of this model when analysed without explanatory variables and confirms statistically significant differences in STEM teacher education background and student learning outcomes between provinces, as well as the significant advantage of boarding schools in all three measures. It also confirms that there is no statistically significant difference in school quality measure by school leadership gender.

Table 4: Regression results with control variables only

	Equipment		Staffing		Learning outcomes	
	Coef.	Std. err.	Coef.	Std. err.	Coef.	Std. err.
Gender	0.052	(0.06)	0.014	(0.02)	0.416	(1.93)
School leader position	0.050	(0.05)	0.016	(0.02)	0.674	(1.76)
Boarding school	0.723***	(0.08)	0.238***	(0.02)	29.222***	(3.71)
East province	0.013	(0.06)	0.127***	(0.03)	12.601***	(2.18)
North province	-0.003	(0.06)	0.079**	(0.03)	9.491**	(2.94)
South province	0.041	(0.07)	0.071***	(0.02)	3.926	(2.50)
N	350		349		299	
F	12.32		20.08		31.62	
df_m	6		6		6	
r2	0.13		0.13		0.23	

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

3. School quality and school leadership practices

In this section, we examine whether school quality is associated with specific practices related to REB school leader standards, both in terms of time allocation and frequency of interactions or activities.

Establishing a school improvement plan is standard and not associated with school quality measures

Based on REB standards, *creating a strategic direction for the school* requires involving members of the school community and stakeholders – including students, staff, parents, local leaders and development partners - in setting and working towards achieving a shared school vision and mission (REB, 2020). By comparing Rwandan head teachers' and teachers' reasons for considering a school to be a "good" school, Cheriyan et al. (2020) show that the majority of school leaders share a similar vision for their schools with their teaching staff. We use school leaders' participation in establishing a school improvement plan as a proxy for this standard.

Most school leaders reported that they recently participated in the preparation of a school improvement plan. The vast majority (93%) of surveyed school leaders participated in preparing a school improvement plan in 2019. Head teachers were more likely to report doing so than Directors of Studies (98% compared to 86%), but there is no statistically significant difference by gender or type of school. Given the limited variability shown in this practice, it is not surprising that we find no statistically significant association between our school quality measures and reported participation in a school improvement plan (see Table 10 in the Appendix).

Time spent by school leaders on administrative tasks is associated with lower student learning outcomes

According to REB standards, **managing the school as an organisation** entails managing operations and facilities in ways that maximise the use of resources to promote a safe, efficient and effective learning environment (REB, 2020). School management primarily requires time spent on leadership and administrative tasks, which is our first proxy. It also involves ensuring the availability of adequate teaching and learning resources, which is more difficult to capture. The extent to which school leaders can influence the provision of those inputs is unclear and would require further research on the budget allocation processes in Rwanda. Managing the school also implies setting school rules and enforcing a staff code of conduct, which we capture through teacher absenteeism and lateness.

Students' learning outcomes are negatively associated with the share of time school leaders spent on administrative and leadership tasks and meetings.

Head teachers spend, on average, 31% of their time on administrative and leadership tasks, compared to 23% for Directors of Studies. There is no statistically significant difference in the share of time spent in this area by type of school or gender (see Table 5), although female school leaders are much less likely to spend the greatest share of their time on administrative tasks. We find that higher levels of STEM pass rates and shares of qualified teachers are negatively associated with time spent on administrative and leadership tasks (see Table 11 in the Appendix). In particular, schools whose leaders spend the greatest amount of time on administrative and leadership tasks report statistically significantly lower STEM exam pass rates.

Teacher absenteeism, as reported by school leaders, is associated with lower satisfaction with school equipment and student learning outcomes. Most school leaders reported that teachers are rarely absent (83%) or late (90%). Furthermore, 11% and 6% of school leaders respectively declared this never happens. Leaders of boarding schools are more likely to report that teachers are never late (20% of them) or absent (30%) than other school leaders (see Table 5). Schools where teachers are never absent have significantly higher STEM passing rates (see Table 11 in the Appendix) and report greater satisfaction with equipment. This could suggest a higher social desirability bias (tendency of survey respondents to answer questions in a manner that will be viewed favourably by others) among boarding school leaders, more stringent policies for teachers' lateness or absence in those schools, or possibly greater motivation for teachers not being late or absent.

Table 5: Descriptive statistics – Managing the school as an organisation

	All	Male	Female	Δ	Director of Studies	Head teacher	Δ	Day school	Boarding school	Δ
Time spent on administrative and leadership tasks	27.8	28.2	26.3		**23.1**	**31.3**	***	27.4	30.4	
Greatest share of time spent on administrative and leadership tasks	**0.45**	**0.46**	**0.37**	**	**0.25**	**0.59**	***	0.44	0.48	
Teachers are never late	0.06	0.06	0.04		**0.10**	**0.03**	***	**0.04**	**0.20**	***
Teachers are never absent	0.11	0.12	0.09		0.12	0.11		**0.08**	**0.30**	***

Note: Statistically significant differences are displayed in bold in the table with statistical significance level in the next column denominated by Δ (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

Student learning outcomes are higher where leaders spend the greatest share of their time on curriculum- and teaching-related tasks

Following REB's guidelines, **leading learning** involves ensuring that students have the opportunity for effective learning within a conducive, safe and inclusive environment that is continuously refined to improve instruction for all students (REB, 2020). Leading learning primarily requires spending time interacting with students and engaging in curriculum- and teaching-related tasks, which are our first proxies. Leading learning also includes regularly assessing teaching methods and their alignment with the national curriculum. In this study, we asked school leaders about their use of four methods to assess teaching skills: checking teachers' lesson plans, checking student notebooks, reviewing student test results, and conducting classroom observations.

Student learning outcomes are higher where leaders spend the greatest share of their time on curriculum- and teaching-related tasks. School leaders spend, on average, 28% of their time on curriculum- and teaching-related tasks and 19% interacting with students (see Table 6). In line with their expected role, Directors of Studies spend more time on both (32% and 20%, respectively) than do head teachers (25% and 18%, respectively). Directors of Studies are more likely to spend more time on curriculum- and teaching-related tasks: 58% of them allocate the greatest share of their time to these, compared to 31% of head teachers. While 11% of school leaders spend the greatest share of their time interacting with students, boarding school leaders are statistically significantly more likely to do so (18%, compared to 10% of leaders of day schools). The shares of time spent on curriculum and teaching tasks or interacting with students are not associated with school quality measures themselves. However, STEM passing rates are higher on average when the school leader spends the greatest share of time on curriculum- and teaching-related tasks (see Table 12 in the Appendix).

Most school leaders reported using a range of methods to assess the teaching skills of their staff. Most school leaders reported using all four listed assessment methods every month. Checking the teacher's lesson plan and observing teachers in their classroom are the two most widely used assessments: 90% and 87% of school leaders, respectively, report using them on a monthly basis. Three quarters of school leaders also reported checking students' test results and notebooks every month. There is small variability in those practices by gender, leader position or school type (see Table 6). This is somewhat higher than findings of Cheriyan et al. (2020), which reported that although almost all teachers indicated that their teaching was evaluated by the head teacher or Director of Studies, and 42% reported they were evaluated monthly, suggesting here again that there might be some social desirability bias.

Student learning outcomes are positively associated with frequent classroom observations and checks on teacher lesson plans. Interestingly, no association was found between the frequency of teacher assessments (whichever method used) and the share of qualified STEM teachers. However, higher STEM passing rates are associated with monthly classroom observations and reviews of teachers' lesson plans (see Table 12 in the Appendix).

Table 6: Descriptive statistics - Leading learning

	All	Male	Female	Δ	Director of Studies	Head teacher	Δ	Day school	Boarding school	Δ
Share of time spent on curriculum and teaching related tasks (%)	27.8	27.6	29.0		**31.6**	**25.1**	***	28.1	26.5	
Share of time spent interacting with students (%)	19.1	19.1	19.0		**20.4**	**18.1**	**	19.0	19.8	
Greatest share of time spent on curriculum and teaching related tasks	42%	40%	49%		**58%**	**31%**	***	0.44%	32%	
Greatest share of time spent interacting with students	11%	11%	10%		13%	10%		**10%**	**18%**	*
Performs classroom observation each month	87%	88%	85%		89%	86%		88%	84%	
Checks teacher lesson plans each month	90%	91%	87%		92%	89%		**91%**	**82%**	**
Checks students' notebooks each month	76%	76%	76%		78%	74%		76%	74%	
Checks students' test results each month	76%	76%	78%		**81%**	**72%**	**	75%	80%	

Note: Statistically significant differences are displayed in bold in the table with statistical significance level in the next column denominated by Δ (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

Table 7: Descriptive statistics - Leading teaching

	All	Male	Female	Δ	Director of Studies	Head teacher	Δ	Day school	Boarding school	Δ
Meets with teachers less than once a month	5%	6%	4%		**8%**	**3%**	**	6%	4%	
Meets with teachers monthly	**60%**	**57%**	**74%**	***	**52%**	**66%**	***	61%	52%	
Meets with teachers every two weeks	17%	17%	13%		**21%**	**13%**	***	17%	12%	
Meets with teachers weekly or more	**18%**	**20%**	**9%**	***	18%	18%		**16%**	**32%**	***
Never provides CPD	**18%**	**16%**	**24%**	*	17%	18%		17%	20%	
Provides CPD less than every month	13%	13%	13%		**9%**	**16%**	**	14%	10%	
Provides CPD every month	46%	46%	46%		44%	47%		47%	40%	
Provides CPD several times a month	**23%**	**25%**	**18%**	*	**31%**	**18%**	***	22%	30%	

Learning outcomes are positively associated with frequent leaders' interactions with teachers

REB defines *leading teaching* as supporting teachers through ongoing, actionable feedback and needs-based professional development to ensure that rigorous, relevant and evidence-based teaching and authentic learning experiences meet the needs of all students and are in line with the Competence Based Approach (REB, 2020). Leading teaching involves interacting with teaching staff, including meeting teaching staff and providing them with CPD. We capture this using the frequency with which school leaders hold meetings with teachers and provide CPD.

Most school leaders meet and provide CPD to teachers on a monthly basis. Most school leaders organise meetings with teachers each month (60% of school leaders) and very few (5%) meet less than once a month. A third of school leaders hold these meetings more frequently: 17% report meeting with teachers every two weeks and 18% report having weekly or more frequent meetings. Most school leaders (82%) report providing CPD to their staff. Close to half (46%) report doing so every month and 23% on a more regular basis.

Leaders of boarding schools and Directors of Studies are more likely than other leaders to interact frequently with teachers. Nearly a third of leaders of boarding schools meet with teachers every week, compared to 16% of leaders of day schools (see Table 7). Similarly, Directors of Studies provide CPD to teachers more frequently: 31% do so more than once a month, compared to 18% of head teachers.

Male school leaders meet and provide CPD to teachers more frequently than female leaders. Three out of four female leaders organise meetings with teachers once a month, which compares with 57% for male leaders (see Table 7). Male school leaders are more likely to hold meetings more frequently (37%, compared to 22% of female school leaders). Female school leaders are also significantly less likely to provide frequent CPD to their staff: 24% of them never provide CPD (compared to 16% of male leaders), and only 18% provide CPD several times a month (compared to 25% of male leaders).

Higher student learning outcomes and lower satisfaction with equipment are associated with frequent school leader interactions with teachers. Schools headed by a leader who provides CPD to their staff several times a month or meet teachers every week have higher STEM examination passing rates. Conversely, schools where CPD is never provided to teachers or schools where staff meetings are held less than once a month have statistically significantly lower STEM examination passing rates. Satisfaction with equipment is negatively associated with the frequency

of meetings and CPD provided to teachers: this satisfaction is higher where leaders hold meetings less frequently (see Table 13 in the Appendix).

Higher satisfaction with equipment and student learning outcomes is associated with better cooperation with parents

REB standards define working with parents and the wider community as practicing two-way communications and use appropriate communication and collaboration skills to accomplish school and system goals by building and maintaining relationships with students, teachers, parents, and the community (REB, 2020). Our first proxies for this standard are the shares of time spent interacting with parents and caregivers, and the community, business and industry. The second proxies are the frequency of meetings with parents to discuss student learning progress and the quality of their cooperation, which are also used to capture the quality of relationships with parents.

Less than a fifth of school leaders' time is spent engaging with parents and the community, business, and industry. On average, leaders spend 11% of their time interacting with parents and caregivers and 6% with the community, businesses, and industry. Leaders of boarding schools spend slightly less time interacting with parents and the community than leaders of day schools (10% compared to 12%), while Directors of Studies spend statistically significantly less of their time interacting with the community and industries (5% compared to 6% for head teachers).

Most school leaders report discussing student learning progress with parents every term. Reporting about overall student learning achievements is standard: virtually all school leaders (99%) report sending report cards to parents more than once a year. School examinations are conducted each term in Rwanda, which coincides with the frequency of engagement with parents reported by 74% of school leaders. In addition, 19% of school leaders report meeting parents less than once a term and 7% report meeting parents every month (see Table 8). However, boarding schools seem to have a statistically significantly different parent engagement calendar, with 42% of leaders meeting with parents every quarter and 36% every semester or less frequently. There are also some differences in frequencies between Directors of Studies and head teachers, but none across gender (see Table 8).

School leaders report low satisfaction with cooperation with parents. 42% of school leaders report being satisfied with the level of cooperation from parents. Satisfaction is even lower among female school leaders (35% compared to 44% for male leaders). Cooperation with parents is much higher for boarding school leaders (82% of them) than in day schools (36% of them).

The quality of engagement with parents reported by leaders is associated with higher student learning outcomes and satisfaction with equipment. Time spent

interacting with caregivers is associated with higher proportions of qualified STEM teachers, suggesting that better-educated teachers spend more time interacting with caregivers. However, there is no clear best practice in terms of frequency: while discussing student learning with parents only once a semester is associated with higher STEM examination passing rates, higher shares of qualified STEM teachers are associated with both semester and monthly engagement (see Table 14 in the Appendix). Satisfaction with parents' cooperation is associated with both higher STEM examination passing rates and satisfaction with equipment.

Table 8: Descriptive statistics - Working with parents and the wider community

	All	Male	Female	Δ	Director of Studies	Head teacher	Δ	Day school	Boarding school	Δ
Share of time spent interacting with parents/caregivers (%)	11.4	11.2	12.3		11.3	11.5		**11.7**	**9.7**	*
Share of time spent interacting with the community/businesses (%)	5.7	5.7	5.9		**4.9**	**6.3**	***	5.9	4.9	
Never invites parents to talk about student learning progress	10%	11%	7%		**14%**	**7%**	***	10%	10%	
Invites parents every semester to talk about student learning progress	9%	9%	10%		7%	11%		**05**%	**36**%	***
Invites parents every term to talk about student learning progress	74%	73%	78%		**69**%	**78%**	***	**79**%	**42**%	***
Invites parents every month to talk about student learning progress	7%	7%	4%		**10%**	**04%**	**	**6**%	**12**%	**
Satisfied with level of cooperation from parents	**42%**	**44%**	**35%**	*	46%	39%		**36**%	**82**%	***

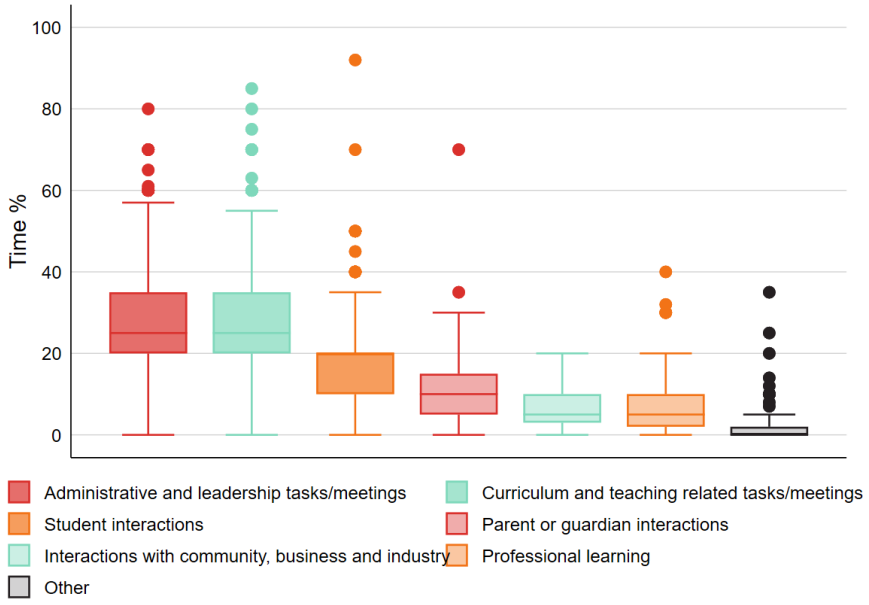
Table 9: Descriptive statistics – Diversified leadership

	All	Male	Female	Δ	Director of Studies	Head teacher	Δ	Day school	Boarding school	Δ
Indicator of time allocation concentration	2,747.7	2,741.6	2,772.7		**2,902.3**	**2,635.7**	***	2,738.3	2,803.8	
Share of time spent on professional learning (%)	6.6	6.6	6.4		**7.3**	**6.1**	**	6.6	6.3	
Share of time spent on other tasks (%)	1.5	1.6	1.1		1.4	1.6		**1.3**	**2.4**	*

Diversified leadership is associated with more qualified teachers and higher student learning outcomes

We construct an index of school leadership task diversification to measure the extent of school leaders' holistic leadership. Beyond individual school leadership standards, we explore how school leaders balance their time (see Figure 4) between administrative and leadership tasks/meetings, curriculum- and teaching-related tasks/meetings, interactions with students, with parents or guardians, the community, but also professional learning (7% of their time on average) and other tasks (1%). To investigate the concept of holistic leadership – the extent to which leaders manage to dedicate time to each of the many dimensions of their work – we construct a Herfindahl-Hirschman Index (HHI). This index enables us to measure school leaders' time diversification across tasks, with a high value capturing a low level of diversification.[8]

Figure 4: School leaders' time allocation distribution by task



Note: School leaders report spending 0 - 80% of their time on administrative and leadership tasks and meetings, with a median of 25%. For each task, the lowest bar is the lower adjacent value, the lowest end of the box is the 25th percentile, the bar within the box is the median, the highest end of the box is the 75th percentile, the highest bar the highest adjacent value, and dots above are outside values.

Multitasking leaders are associated with higher shares of qualified STEM teachers and students learning outcomes. The extent of task diversification is not associated with gender or type of school. However, Directors of Studies allocate their

[8] The HHI is calculated by squaring the time shares allocated to each type of task and then summing the resulting numbers. It ranges from close to 0 (maximum level of diversification, if working time is split evenly across all tasks), to 10 000 (lowest level of diversification, occurring if a school leader engages solely in one task).

time in a significantly less diversified way than head teachers (see Table 9), suggesting that they specialise in a few tasks, whereas head teachers allocate their time more evenly across a variety of tasks. Overall, we also find that the diversification of tasks on which school leaders spend time is associated with higher STEM passing rates and shares of qualified STEM teachers (see Table 15 in the Appendix). This raises the question of whether the most effective school leaders are the ones who perceive their jobs as being more holistic.

Conclusion and opportunities for further research

There is room to reduce the gender imbalance in school leadership positions and to strengthen school leadership training. In this paper, we drew a portrait of school leaders in secondary schools participating in the Leaders in Teaching initiative. We found that only one fifth of school leaders are women, which shows that there is room to recruit more women in leadership positions. We also show that a significant proportion of school leaders have limited teaching experience, and that there is room to provide more school leaders with mentoring and STEM teaching-related training. This is all the more important given that enhanced mentoring skills will then help them provide teachers with frequent CPD, which seems to be associated with higher student learning outcomes.

School leaders in Rwanda appear to have limited influence on their school's equipment and staffing. In this paper, we also explored characteristics and practices that could be associated with good school leadership in Rwanda. For this, we used three proxies of school quality: (i) average leaders' and teachers' satisfaction with school equipment, (ii) school's share of qualified STEM teachers and (iii) school-level STEM examination passing rate. Overall, there is no consistent picture emerging across the school quality measures we explored. Although we identify a range of statistically significant associations between school leadership practices and student learning outcomes (see key findings), we found much fewer associations with our measures of school resources. Weak associations between school leadership style on the one hand, and school equipment and staffing on the other, could suggest that school leaders in Rwanda have limited influence on their school resources.

Potential areas for further research on the quality of school leadership in Rwanda could include:

1. Going beyond simple correlations and using value-added measures of student learning outcomes that would better reflect school quality. For example, this analysis could be replicated with measures of improvement in student ability, comparing test results at the start and end of a school year.
2. Examining additional dimensions of school leadership. For instance, additional information could be collected to reflect other aspects of national school leadership standards developed by REB.
3. Investigating alternative measures of school quality. In particular, we recognised that school resources could be explored using more objective indicators, and that teaching quality is not fully captured by teachers' education background.

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Appendix

Table 10: Regression results - “Creating a strategic direction for the school”

Dependent variable:	Equipment	Staffing	Learning outcomes
School improvement plan	0.165	-0.014	5.840
Boarding school	0.725***	0.238***	29.440***
Gender	0.046	0.015	0.188
School leader position	0.032	0.018	0.126
East province	0.009	0.127***	12.554***
North province	0.001	0.079**	9.706**
South province	0.034	0.072***	3.838

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

Table 11: Regression results - “Managing the school as an organisation”

	Dependent variable											
	Equipment				Staffing				Learning outcomes			
Explanatory variable												
Administrative and leadership tasks/meetings	-0.002				-0.002*				-0.183**			
Greatest share of time spent on administrative and leadership tasks		-0.036				-0.017				-5.621**		
Teachers are never late			0.138				-0.048				0.889	
Teachers are never absent				0.192*				0.020				10.754***
Control variables												
Boarding school	0.729***	0.724***	0.700***	0.681***	0.243***	0.239***	0.247***	0.234***	29.524***	29.192***	29.073***	26.734***
Gender	0.049	0.050	0.055	0.057	0.012	0.013	0.013	0.015	0.184	0.138	0.442	0.745
School leader position	0.066	0.062	0.061	0.054	0.028	0.022	0.013	0.016	2.185	2.646	0.754	1.092
East province	0.010	0.015	0.016	0.017	0.124***	0.127***	0.126***	0.127***	12.142***	12.688***	12.637***	13.042***
North province	-0.011	-0.003	0.003	-0.010	0.073**	0.079**	0.076**	0.079**	8.741**	9.489**	9.539**	9.370**
South province	0.041	0.039	0.040	0.036	0.071***	0.070***	0.071***	0.071***	3.587	3.567	3.936	3.811
N	350				349				299			
Df	7				7				7			
F	11.59	10.80	11.89	11.48	19.15	18.42	17.27	24.27	27.53	27.17	26.73	30.23
R2	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.25	0.25	0.24	0.25

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

Table 12: Regression results - “Leading learning”

	Dependent variable											
	Equipment				Staffing				Learning outcomes			
Explanatory variable												
Greatest share of time spent on curriculum and teaching related tasks	-0.018				0.011				5.323**			
Perform classroom observation each month		-0.080				0.009				6.183*		
Check teacher lesson plans each month			-0.069				-0.030				8.103**	
Check students' notebooks each month				-0.142**				-0.022				0.637
Control variables												
Boarding school	0.721***	0.720***	0.717***	0.720***	0.240***	0.239***	0.236***	0.238***	29.612***	29.582***	30.244***	29.261***
Gender	0.053	0.048	0.048	0.052	0.014	0.015	0.013	0.015	0.218	0.773	1.046	0.425
School leader position	0.045	0.047	0.047	0.045	0.019	0.016	0.015	0.015	2.112	0.980	1.039	0.698
East province	0.014	0.015	0.013	0.011	0.127***	0.127***	0.127***	0.126***	12.456***	12.461***	12.530***	12.614***
North province	-0.003	-0.013	-0.011	-0.016	0.079***	0.080***	0.075***	0.077***	9.514**	10.153***	10.154**	9.535**
South province	0.041	0.044	0.041	0.029	0.071***	0.071***	0.071***	0.069***	3.907	3.668	3.784	3.994
N	350				349				299			
Df	7				7				7			
F	10.46	10.34	10.55	13.49	19.51	17.79	19.95	18.08	26.28	31.47	31.38	27.23
R2	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.25	0.24	0.24	0.24

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

Table 13: Regression results - Leading teaching

	Dependent variable											
	Equipment				Staffing				Learning outcomes			
Explanatory variable												
Meet with teachers less than once a month	0.302**				-0.026				-10.851*			
Meet with teachers weekly or more		-0.198***				0.018				4.129*		
Never provides CPD			0.089				0.019				-7.603***	
Provide CPD several times a month				-0.113*				0.043*				3.785*
Control variables												
Boarding school	0.727***	0.754***	0.721***	0.732***	0.238***	0.236***	0.238***	0.235***	29.290***	28.720***	29.688***	29.114***
Gender	0.057	0.030	0.046	0.042	0.014	0.016	0.013	0.018	0.382	0.818	1.187	0.705
School leader position	0.064	0.047	0.050	0.035	0.015	0.016	0.016	0.022	0.172	0.665	0.884	1.138
East province	0.037	0.020	-0.006	0.016	0.125***	0.126***	0.123***	0.126***	11.652***	12.502***	14.395***	12.550***
North province	0.001	-0.018	-0.010	-0.019	0.079**	0.080**	0.078**	0.085**	8.776**	9.790***	9.937**	10.045**
South province	0.051	0.036	0.024	0.038	0.070***	0.072***	0.067***	0.072***	3.383	4.235	5.470*	4.092
N	350				349				299			
Df	7				7				7			
F	10.70	13.07	10.84	11.89	17.91	19.13	18.34	19.75	26.95	26.39	28.51	29.83
R2	0.14	0.15	0.14	0.14	0.13	0.13	0.13	0.13	0.24	0.24	0.25	0.24

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

Table 14: Regression results - Working with parents and the wider community

	Dependent variable											
	Equipment				Staffing				Learning outcomes			
Explanatory variable												
Share of time spent interacting with parents/caregivers	0.006				0.004***				0.014			
Invites parents every semester to talk about students' learning progress		-0.020				0.082**				9.135**		
Invites parents every term to talk about students' learning progress			0.030				-0.107***				-0.720	
Satisfied with level of cooperation from parents				0.223***				0.024				6.286***
Control variables												
Boarding school	0.736***	0.729***	0.734***	0.619***	0.249***	0.213***	0.197***	0.227***	29.251***	26.341***	28.939***	26.448***
Gender	0.044	0.052	0.051	0.067	0.008	0.012	0.019	0.016	0.393	0.077	0.442	0.621
School leader position	0.046	0.050	0.047	0.067	0.014	0.014	0.027	0.018	0.662	0.269	0.711	1.223
East province	-0.003	0.012	0.011	0.033	0.114***	0.131***	0.136***	0.129***	12.563***	13.004***	12.667***	13.216***
North province	-0.009	-0.002	-0.001	-0.001	0.074**	0.076**	0.074**	0.079**	9.475**	9.013**	9.468**	9.426**
South province	0.047	0.041	0.041	0.057	0.076***	0.071***	0.070***	0.073***	3.937	3.781	3.917	4.294
N	350				349				299			
Df	7				7				7			
F	11.80	11.01	11.01	16.43	18.58	21.34	21.79	17.41	27.18	31.04	27.10	35.08
R2	0.14	0.13	0.14	0.16	0.14	0.13	0.15	0.13	0.23	0.25	0.24	0.25

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

Table 15: Regression results – Diversified leadership

	Dependent variable								
	Equipment			Staffing			Learning outcomes		
Explanatory variable									
Indicator of time allocation concentration	-0.000			-0.000*			-0.002*		
Share of time spent on professional learning		0.013**			-0.001			0.213	
Share of time spent on other tasks			-0.011*			0.003			1.379***
Control variables									
Boarding school	0.727***	0.729***	0.735***	0.241***	0.238***	0.235***	29.341***	29.292***	27.941***
Gender	0.051	0.053	0.047	0.014	0.014	0.016	0.430	0.371	1.089
School leader position	0.039	0.063	0.051	0.009	0.015	0.016	0.041	0.890	0.665
East province	0.007	0.012	0.012	0.123***	0.127***	0.127***	12.105***	12.426***	12.454***
North province	0.005	0.011	-0.003	0.084**	0.078**	0.079**	9.517**	9.508**	9.871***
South province	0.053	0.078	0.043	0.079***	0.069***	0.071***	4.472	4.395	3.571
N		350			349			299	
Df		7			7			7	
F	11.62	11.44	10.79	17.86	17.60	18.77	27.77	28.36	30.54
R2	0.14	0.15	0.14	0.13	0.13	0.13	0.24	0.24	0.27

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

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