Economics of Education Review 94 (2023) 102396

Contents lists available at ScienceDirect

Economics of Education Review

journal homepage: www.elsevier.com/locate/econedurev

Enlightening communities and parents for improving student learning: Evidence from Niger

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ARTICLE INFO

JEL classification:
I20
I28
D83
D91
O20

Keywords:
Education policy
Accountability
Information
Decentralization
School grants
Community participation

ABSTRACT

Providing local communities with the authority to manage school grants is a popular education policy in the developing world. However, recent studies suggest that this type of intervention has limited impact on student learning outcomes as such communities do not have adequate capacity to utilize resources. To investigate how communities can effectively utilize school resources, we conducted a randomized experiment in Niger. Communities and parents were provided with information about student learning together with school grants. They also participated in discussions about how communities and schools can work together utilizing the grants and communities' own resources. After the intervention, the communities increased activities that enhanced student effort, and parents increased their contribution to school activities and engagement in children's learning at home. As a result, student test scores improved by 0.43 standard deviations in math and 0.20 standard deviations in French. The impact was largest for the lowest-performing children.

1. Introduction

Improving student learning is a crucial challenge for the developing world. While primary school enrollment has increased considerably in the last two decades, progress in learning has been seriously slow (World Bank, 2017). More than one-half of children worldwide do not have basic literacy and numeracy skills, irrespective of whether or not they go to school (UNESCO Institute for Statistics, 2017). During this schooling expansion period, many developing countries have adopted policies to decentralize authority in school management from the government to the local communities and parents. Providing school grants is often implemented under this initiative, where school committees and local communities are given the power to manage these grants (Barrera-Osorio, Fasih & Patrinos, 2009; Bruns, Filmer & Patrinos, 2011).[1] However, recent studies have found decentralization and school grant policy to be one of the least effective measures to improve student learning (Angrist et al., 2020; Evans & Popova, 2016; McEwan, 2015; Snilstveit et al., 2015).

This paper examines how communities and parents can manage school grants effectively to improve children's learning in Niger. To evaluate the intervention, we conducted a field experiment in collaboration with a program called "Ecole pour Tous (EPT)," or "School for All" project. EPT is a community participation program in education that has been jointly implemented by the Niger Federal Ministry of Education and Japan International Cooperation Agency (JICA) since 2004, originally aiming at making school committees function effectively. In the EPT's initial model, school committee members were selected by a secret ballot election in which any adult residents within the school district could participate. With the committee's facilitation, the community and the school discussed intensively and worked together to develop and implement an annual school improvement plan with the community's own resources. This intense collaboration between the community and the school is a fundamental principle that characterizes the EPT model, which is different from many other community-driven education initiatives that aim to strengthen accountability against the school (Hara, Maruyama, Kageyama & Kunieda, 2020). While this initiative has been successful in enhancing community participation and access to primary education and has been expanded into neighboring countries such as Senegal, Burkina Faso, Mali, and Côte d'Ivoire, there is space for further refinement to improve the education quality.

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[1] Another important policy implemented in this period is fee-free education. In many countries, school grants were introduced to make up for the funds that were previously collected from parents (Lugaz & Grauwe, 2016).

https://doi.org/10.1016/j.econedurev.2023.102396
Received 9 July 2022; Received in revised form 11 March 2023; Accepted 13 March 2023
Available online 5 April 2023

In our experiment, EPT included two additional interventions into the initial model by (i) providing school committees with grants, and (ii) sharing information on student performance and learning with communities and parents, as well as facilitating the discussion on how communities and schools can work together to foster student learning (information-sharing intervention). In the second intervention, school committee members participated in training to conduct a series of school-level activities to enhance community awareness and improve resource utilization for learning. After the training, school teachers conducted student tests and summarized the results in a comprehensive manner for the community and parents. In the next step, school committees organized an assembly to present the test results to the community and parents, explain the importance of learning, identify the challenges faced by schools, and discuss how the community and parents can work with the school to improve student learning.

One and a half years after the intervention, we found that while school grants alone had little impact, when the information-sharing intervention was implemented in addition to grants, student test scores improved by 0.42 standard deviations in math and 0.20 standard deviations in French, with the lowest-performing children experiencing the most significant impact. In the schools where school grants were provided without information sharing, grants were utilized to purchase school inputs such as textbooks, teacher's guides, and school supplies, but these resources alone may not have been enough to improve student performances. In contrast, in schools where grants were provided together with information sharing, grants were utilized for activities that encouraged student studies, such as supplementary and night classes, in addition to purchasing the above-mentioned school inputs. Students of these schools also studied more at home and were supported by their families more often. In addition, parents took more interest in their children's studies and increased monetary contributions to the school committee.

This study contributes to the existing literature in several ways. First, it investigates how schools and parents can effectively utilize resources for student learning, which is an unresolved question in education policy in the developing world. Previous studies show that school inputs alone have little impact on student learning even though these improve student enrollment (Beasley & Huillery, 2016; Blimpo, Evans & Lahire, 2015; Glewwe, Kremer & Moulin, 2009, 2004; Pradhan et al., 2014).

An important reason behind the limited impact of the school grants is that they are not spent effectively due to the limited capacities of community members responsible for managing them. In Niger, Beasley and Huillery (2016) provide evidence that the grants are utilized for items that do not improve student performance, such as school infrastructure and investment in agricultural projects. In the Gambia, Blimpo et al. (2015) find that school grants with school management training improve student performance in villages with high literacy but have negative results in low literacy villages. In Mexico, Gertler, Patrinos and Rubio-Codina (2012) also show that grants and training have no impact in extremely poor communities, where parents may lack the capacity to voice their needs. Another possible reason might be that parents reduce their involvement in their children's education in response to increased school resources. In the United States, Houtenville and Conway (2008) find a negative correlation between school resources and parental behavior, such as discussions with children and attending school meetings, suggesting that school resources decrease parental effort toward their children's education. In India and Zambia, Das et al. (2013) find that when schools are given surprise grants, children's test scores improve, but when parents anticipate the grants, they decrease household spending on education, and the test scores do not improve. Thus, in many developing countries where parents have little schooling, can communities and parents manage the school grants effectively to improve student learning? This study answers this question and presents a pathway through which the intervention can overcome the communities' limited capacity.

Second, this study provides insight into how information changes the behavior of communities and parents to improve student learning. In theory, providing parents with information on students, schools, and parental rights can affect student learning by putting pressure on schools and teachers (Bruns et al., 2011). However, evidence from empirical studies suggests that its impact on student learning is mixed in low- and middle-income countries (de Hoyos, Garcia-Moreno & Patrinos, 2017; Mbiti, 2016). For example, in India, Banerjee, Banerji, Duflo, Glennerster and Khemani (2010) find that information about the community's role on school oversight and student learning does not change teacher effort or improve children's learning. In Kenya, Lieberman, Posner, and Tsai (2014) show that the provision of information about student test scores has no impact on parental behavior. In contrast, in Mexico, de Hoyos et al. (2017) find that dissemination of test score information and diagnostic feedback increases student test scores.

A mechanism that makes information intervention work can be the market, which provides parents with alternative school choices and pressurizes schools to improve, as suggested by studies in Pakistan (Andrabi, Das & Khwaja, 2017), India (Afridi, Barooah & Somanathan, 2020), and Brazil (Camargo, Camelo, Firpo & Ponczek, 2018). These studies show that disclosing information about student test scores does not change student learning performance in public schools but improves performance in private schools. However, in many low-income countries, public schools are the only option for most people due to the school location or parents' ability to pay. The study in Niger contributes to these discussions by showing that, even without the market, local communities and parents play a complementary role in improving student learning by helping schools improve their environment and aiding their children in studying at home.[2] To encourage communities and parents to actively play this role, school committee members do not just provide information about student learning but also facilitate discussions during community assemblies to build consensus on how communities and parents can work collaboratively with schools. The emphasis on consensus-building and collaboration between the community and the school differentiates this intervention from other information interventions that pressurize schools to improve their service delivery.

A key limitation of this study is that it is not clear whether the information-sharing intervention would be effective if implemented separately from grants, as two interventions may complement each other, such that the impact of the information-sharing intervention without grants would be smaller than the simple difference between the impacts of the two treatments.[3] To see the impact of the information-sharing intervention alone, we needed to create another treatment group where the information is shared without grants. However, since the primary interest of the Niger Ministry of National Education was grant utilization, we created only two treatment groups. Although the information-sharing intervention itself could have some impact on learning outcomes without providing grants, a further study is necessary to prove this.

The rest of this paper is organized as follows: Section 2 describes the program and the data collection for the evaluation. Section 3 explains the evaluation methodology, and Section 4 presents the program's

[2] This role has been often overlooked in the literature concerning developing countries. An exception is Barrera-Osorio et al. (2020), which focuses on parental support for children's learning at home in Mexico. Although they did not find effects on learning achievement, information provision increased parental effort in children's home study.

[3] Mbiti et al. (2019) show evidence of complementarities between school grants provision and an additional intervention (teacher performance pay). They set three treatment groups that conducted (i) a school grant program, (ii) a teacher performance pay program, and (iii) a combination of these two interventions. The results show that test score gains in (iii) the combination were significantly greater than the simple sum of gains in (i) grants provision and gains in (ii) teacher performance pay.

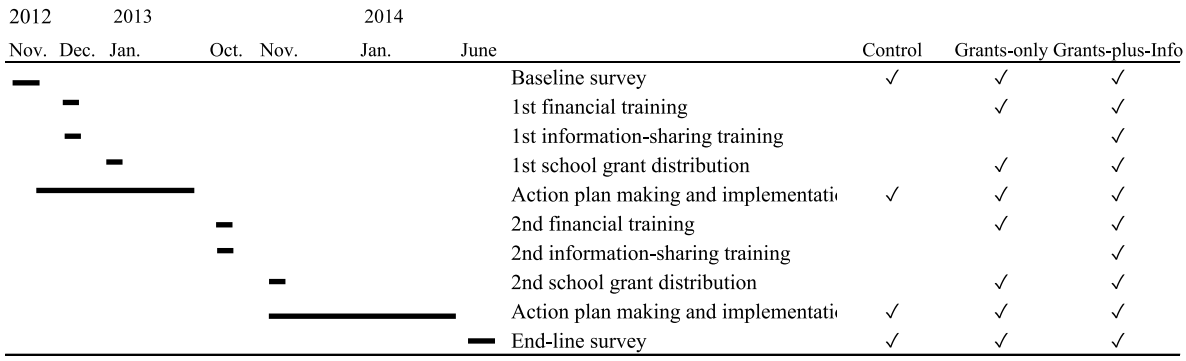

Fig. 1. Timeline of the surveys and interventions.

impact on student learning outcomes and examines critical factors that can affect student learning (such as school committees' activities, student effort, parental effort, teacher effort, and school committee effort). Section 5 offers the conclusion.

2. Context and experimental design

Since the early 2000s, Niger has made remarkable progress in providing access to primary education, and between 2000 and 2015, the net primary school enrollment ratio increased from 27 percent to 62 percent (UNESCO Institute for Statistics, 2022). An education initiative implemented during this period was establishing new school committees, called Comité de Gestion de l'Ecoles, or COGES. To make school committees function effectively, several measures were introduced by EPT. First, to ensure support from communities, school committee members are selected through secret ballot election at a community assembly.[4] Second, communities and parents are deeply involved in making school committees' annual plans for improving the school environment, such as constructing and repairing classrooms, providing desks and chairs, constructing water facilities, and purchasing learning materials for students. In the assembly held in the early school year, parents, local residents, school teachers, and students gather to share information about challenges schools are facing and discuss community activities that could solve the problems. Based on the discussions, school committees make an annual school improvement plan, and communities approve the plan in the next assembly. Third, in the initial school committee model, the annual plan is implemented with locally mobilized resources. At the end of the school year, communities review the results of the plan implementation. The same cycle is repeated every year: at the beginning of a new school year, communities and parents agree on a new action plan for the coming year, and implement, monitor, and review it using their own resources. In Niger, this initiative was successfully scaled up into nationwide primary schools until 2008 with the assistance of EPT and the World Bank's program (Honda & Kato, 2013). Most schools were continuing the efforts as of 2012 (Kunieda, Maruyama, Kageyama, & Hara, 2020).[5] Further, a similar school committee model was adopted and scaled up by the governments of other Francophone countries, such as Senegal, Burkina Faso, and Mali. A randomized evaluation in Burkina Faso demonstrated that this intervention improved educational outcomes, such as student enrollment and grade repetition (Kozuka, Sawada, & Todo, 2016); it also enhanced social capital among school and community members (Todo, Kozuka & Sawada, 2016; Sawada et al., 2022).

While this school committee policy has significantly contributed to the progress in Niger's education, the country still faces huge challenges in the quality of education. The completion rate of primary school is 49 percent, and only three percent of children complete primary school with sufficient competency in math and science (PASEC, 2015). To resolve the situation, the Niger Ministry of National Education and JICA conducted a field experiment using school grants and the information-sharing intervention to enhance community awareness and improve resource utilization. The experiment was implemented in the Say and Torodi districts of the Tillabery region from December 2012 to May 2014. Out of 328 primary schools in the two districts in 2012, we randomly selected 60 schools for the first treatment group, which received school grants only (Grants-only group); 60 schools for the second treatment group, which received the information-sharing intervention in addition to grants (Grants-plus-Info group); 60 schools for the control group, which received no intervention but underwent a survey for comparison purposes; and 148 schools that neither received any intervention nor underwent the survey. To reduce any imbalance across the groups, we created strata in terms of educational administrative regions (four regions in Say and three regions in Torodi) and school scale (large scale or small scale).[6]

Before the experiment started, school committees already existed and were conducting the activities explained above in all 180 schools, including the control group. For the experimental interventions, EPT first conducted financial training for both the Grants-only and the Grants-plus-Info groups to ensure appropriate management of the school grants. After the financial training, EPT conducted additional training for the Grants-plus-Info group only. In this training, school committee members learned to facilitate community meetings to enhance community awareness of learning and make an effective plan for improving student learning, including important factors for learning (such as classroom hours, school infrastructure and learning materials, and the quality of teaching and learning) and the roles of teachers, principals, community members, parents, and students to implement activities in the plan. After this training, Grants-plus-Info schools conducted student tests in math and French and summarized the results. In the next step, Grants-plus-Info school committees organized a community assembly to make communities aware of the importance of learning and explain students' numeracy and literacy levels by showing the average test

[4] More precisely, six representatives of the parental association are elected by secret ballot at the community assembly, and three of them become school committee members. The other committee members are a representative of mothers' association, the school principal, a representative of school teachers and a representative of students.

[5] According to EPT data, nearly 90% of schools in the country submitted annual data about school committee's activities in 2012/2013.

[6] In Niger, many primary schools do not have all six grades due to limited capacity. We categorized a school as large scale if it had all the three grades that were covered in our survey (grade two, three, and four at the baseline) and as small scale if it lacked one or two grades out of these three. Using this definition, 15 schools were categorized as large and 45 schools were categorized as small in each group.

scores in math and French of each grade of the school.[7] Even before the intervention, schools were providing parents with test scorecards to inform them about their children's learning level, but many parents did not understand the numbers written on the cards or did not even know of their existence. Therefore, EPT utilized the community assembly to enable parents and communities to better understand the real situation of student outcomes, which EPT members presumed to be below most parents' and communities' expectations. Then, school committees described the key factors for improving student learning and facilitated discussion on how communities and schools could work cooperatively to determine appropriate school grant and community resource use to improve student learning. Based on the results of these discussions, school committees made a school improvement plan and organized a second community assembly to gain approval for the plan from the community. After approval, school grants were provided to the committees, and the plan was implemented using the grants and the community's resources.

In this experiment, both the training and grant provision were conducted twice.[8] The first training and grant provision were conducted in December 2012 and in January 2013, respectively, and the second training and grant provision were conducted in October 2013 and in November 2013, respectively. Fig. 1 shows the timeline of the surveys and interventions explained above.

The amount of the grants provided to a school is calculated based on the number of students. If the total student number is 50 or more, the amount for the school is FCFA 2,000 (US$ 4.05) times the total student number; and if the student number is less than 50, the amount provided to the school is FCFA 100,000 (US$ 202). This amount was fixed by considering the size of the country's economy, primary education, and prospects for external assistance.[9] The total amount provided for 120 schools in the first school year was FCFA 26,846,000 (US$ 54,340), and the total amount in the second school year was FCFA 30,066,000 (US$ 60,857).[10]

To evaluate this intervention and understand the mechanism to improve student learning, we collected data by conducting student tests (in math and French) and interviews with school directors, teachers, school committee members, and students' fathers (or other family members when the father was unavailable).[11] The baseline survey was conducted from November through December 2012, and the end-line survey was conducted in June 2014. The tests were conducted for the same children across the surveys, and these children were in the second, third, and fourth grades at the baseline, and most of them became third, fourth, and fifth graders by the end-line test. The tests were developed and administered by an education NGO from Niger and were designed to match students' grade levels in accordance with the national curricula and textbooks. The math tests assessed arithmetic, geometric shapes and measures, and logic, and the French tests assessed writing, reading, and oral skills. The total scores of each subject were calculated using the Item Response Theory (IRT) and were normalized so that the mean and standard deviation of the control group were zero and one, respectively, at each survey round.[12]

3. Empirical methodology

The effects of the two interventions can be estimated using the following equation:

$$y_{ij} = \alpha + \beta_1 GRANTS_j + \beta_2 INFO_j + X_{ij}\gamma + \varepsilon_{ij} \quad (1)$$

where y_{ij} is an outcome of a student i at school j; $GRANTS_j$ is a dummy equal to 1 if a school j is assigned into the Grants-only group and receives school grants but does not have information-sharing intervention, and zero otherwise; $INFO_j$ is a dummy equal to one if a school j is assigned into the Grants-plus-Info group and receives the information-sharing intervention as well as school grants, and zero otherwise; and, X_{ij} is a vector of control variables, including strata dummies, whether a school is located in a rural or urban area, student gender, and baseline outcome value when available. The parameters of interest are β_1, which is the average treatment effect of the Grants-only, and β_2, which is the average treatment effect of the Grants-plus-Info. Standard errors are clustered at the school level when an outcome is estimated at the student or parent level.

4. Results

This section first describes school, teacher, and student characteristics at the baseline survey and shows the balance between the treatment and the control schools. Then, we estimate the impacts on students' test scores and factors that affect the test scores.

4.1. Baseline school and student characteristics

Table 1 shows the summary statistics and tests for balance between the three groups in terms of school characteristics, student test scores and student perceptions, and school committee activities in the baseline survey. To test for balance, I regress each variable on a dummy for membership in the Grants-only or the Grants-plus-Info group.

Panel A shows the balance of the number of students and teachers, proportion of female students, female teachers, contract teachers, and school location (located in rural or urban). The results show that no systematic difference was found across the three groups. Panel B presents the pretreatment balance of student test scores and their perception of learning math and French. In the interview survey, students were given statements such as "I enjoy learning math (or French)" and "I usually do well in math (or French)" and were asked to evaluate them on a scale of "5 = strongly agree," "4 = agree," "3 = neither," "2 = disagree," or "1 = strongly disagree." The results show that these outcomes also have no systematic differences among the three groups.

[7] This intervention is designed for communities and parents to understand the average level of students' skills by showing them the average test scores of the students of each grade. The intervention is not meant for parents to understand their own children's skills by showing each student's test scores.

[8] Since this was a new intervention, EPT revised training content based on the results of the first school year, and conducted the second training in the following year. When this intervention was scaled up into 2,000 schools in other districts in 2016 through the support of Global Partnership for Education (GPE) and the World Bank, the training was conducted only one time since it was not necessary to revise the training contents in the scaled up phase.

[9] In 2012, Niger's GDP per capita was US$ 391.51 (World Bank 2022), government expenditure on primary education was US$ 156 million, and the total enrollment in primary schools was 2 million (UNESCO Institute for Statistics, 2022). The same grants formula was utilized when the grants were introduced by GPE and the World Bank's project.

[10] The amounts of other experimental grants are US$ 500 per school in Gambia (Blimpo, Evans, & Lahire, 2015), US$ 870 in Indonesia (Pradhan et al., 2014), US$ 209 per school (US$ 1.83 per student on average) in Niger (Beasley & Huillery, 2016), and US$ 3,190 per school in Senegal (Carneiro, Koussihouèdé, Lahire, & Meghir, 2016).

[11] We interviewed fathers because, according to an EPT advisor, important decisions about children's education are made by fathers rather than mothers in the surveyed area.

[12] The IRT model is used in large-scale standardized assessments, such as SAT, GRE, TIMSS, and PISA, and its use has been increasing in recent year in development economics literature, such as Andrabi, Das, and Khwaja (2017), Muralidharan, Singh, & Ganimian (2019), Mbiti et al. (2019), Romero, Sandefur, & Sandholtz (2020), and Romero & Sandefur (2022).

Table 1
Pretreatment balance.

		(1)	(2)	(3)	(4)		(5)		(6)	
	Observation	Control	Grants-only	Grants-plus-Info	Grants-only - Control		Grants-plus-Info - Control		Grants-plus-Info - Grants-only	
		Mean	Mean	Mean	Mean Difference	SE	Mean Difference	SE	Mean Difference	SE
Panel A: School Characteristics										
Number of students per school	180	90.600	101.100	106.900	10.500	(13.834)	16.300	(15.386)	5.800	(15.070)
Number of teachers per school	180	3.883	4.117	4.183	0.233	(0.552)	0.300	(0.583)	0.067	(0.592)
Student-teacher ratio	180	26.310	27.887	27.199	1.577	(2.406)	0.888	(2.156)	−0.689	(2.208)
Proportion of female students	180	0.479	0.479	0.453	−0.000	(0.018)	−0.026	(0.020)	−0.026	(0.019)
Proportion of female teachers	180	0.327	0.397	0.363	0.070	(0.066)	0.036	(0.063)	−0.034	(0.066)
Proportion of contract teachers	180	0.828	0.844	0.886	0.016	(0.044)	0.058	(0.038)	0.043	(0.037)
Located in rural area	180	0.983	0.967	0.950	−0.017	(0.029)	−0.033	(0.033)	−0.017	(0.037)
p-value of joint F-test					0.832		0.121		0.332	
Panel B: Student Test Scores and Perception										
Math Test Score	4488	0.000	0.005	−0.102	0.005	(0.106)	−0.102	(0.110)	−0.107	(0.107)
French Test Score	4488	0.000	0.059	−0.117	0.059	(0.119)	−0.117	(0.118)	−0.176	(0.120)
Like Math	4440	4.428	4.498	4.444	0.070	(0.084)	0.015	(0.090)	−0.054	(0.080)
Like French	4440	3.085	3.045	3.147	−0.040	(0.178)	0.062	(0.170)	0.102	(0.167)
Confident in Math	4440	4.467	4.483	4.456	0.016	(0.081)	−0.011	(0.084)	−0.027	(0.083)
Confident in French	4440	2.907	2.964	3.006	0.057	(0.177)	0.099	(0.166)	0.042	(0.168)
p-value of joint F-test					0.195		0.819		0.322	
Panel C: School Committee Activities										
Build or repair classrooms	180	0.833	0.767	0.783	−0.067	(0.073)	−0.050	(0.072)	0.017	(0.077)
Make or purchase school furniture	180	0.050	0.100	0.050	0.050	(0.048)	0.000	(0.040)	−0.050	(0.048)
Purchase textbooks	180	0.467	0.500	0.367	0.033	(0.092)	−0.100	(0.090)	−0.133	(0.090)
Purchase school supplies	180	0.450	0.417	0.417	−0.033	(0.091)	−0.033	(0.091)	0.000	(0.091)
Support teacher training	180	0.250	0.167	0.267	−0.083	(0.074)	0.017	(0.081)	0.100	(0.075)
Purchase teacher's guides	180	0.433	0.433	0.350	0.000	(0.091)	−0.083	(0.090)	−0.083	(0.090)
Encourage parents to send their children to school	180	0.550	0.717	0.667	0.167*	(0.087)	0.117	(0.089)	−0.050	(0.085)
Support implementing supplementary classes	180	0.633	0.633	0.583	0.000	(0.089)	−0.050	(0.090)	−0.050	(0.090)
Support implementing night classes	180	0.350	0.500	0.383	0.150*	(0.090)	0.033	(0.089)	−0.117	(0.091)
Support individual student study	180	0.183	0.100	0.150	−0.083	(0.064)	−0.033	(0.069)	0.050	(0.061)
Monitor student attendance	180	0.767	0.817	0.767	0.050	(0.075)	0.000	(0.078)	−0.050	(0.075)
Monitor teacher attendance	180	0.717	0.683	0.667	−0.033	(0.084)	−0.050	(0.085)	−0.017	(0.086)
Conduct practice exam	180	0.333	0.267	0.350	−0.067	(0.084)	0.017	(0.087)	0.083	(0.085)
Award students who had excellent performance	180	0.383	0.500	0.383	0.117	(0.091)	0.000	(0.090)	−0.117	(0.091)
p-value of joint F-test					0.282		0.954		0.436	
Panel D: Student Attrition										
Attrition Rate	4488	0.196	0.168	0.161	−0.028	(0.019)	−0.035	(0.022)	−0.007	(0.019)

Notes: Panel A shows the pretreatment balance of several school characteristics. Robust standard errors are in parentheses. Panel B shows the pretreatment balance of student test scores and perception. Test scores are normalized so that the mean and standard deviation of the control group are zero and one. Like Math/French and Confident in Math/French show how much students agree with the statements "I enjoy learning math/ French," and "I do well in math/ French," respectively, and the answers are coded by "5 = strongly agree," "4 = agree," "3 = neither/I don't know," "2 = disagree," or "1 = strongly disagree." The number of observations of student perceptions is lower than that of student test scores because we were not able to interview students in one of the Grants-only schools at the baseline survey. Standard errors are clustered at school level. Panel C shows the proportion of school committees that supported or conducted the corresponding activity. Robust standard errors are in parentheses. Panel D shows the proportion of students who took the baseline test but were absent on the end-line test day. Standard errors are clustered at school level.
**Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Panel C presents the pretreatment balance of the school committees' activities.[13] As explained in the second section, even without the experimental interventions, school committees in Niger conduct various activities with the schools' and communities' resources, and we divided these activities into 14 categories. The results show that most activities have no systematic difference across groups, except two activities: encouraging enrollment and supporting night classes.

Panel D shows the student attrition, that is, the rate of students who participated in the baseline test but were absent on the end-line test day. The control group attrition rate is 19.6% and is higher than the attrition rates of the Grants-only and the Grants-plus-Info groups.[14] Although the differences are not statistically significant, they become significant when strata dummies and control variables are included in the regression, which is explained in more detail in Section 4.7.

[13] School furniture (column 2) typically supported by school committees are desks and chairs. Supplementary classes (column 8) are conducted outside of school hours, usually on Thursday afternoons or on Saturdays, and school committees provide a tuition fee for teachers. Night classes (column 9) are conducted during the evening as out of school activities. To support night classes, school committees buy night lamps and oil for the lamps. Practice exams (column 13) are conducted for sixth graders to practice an exam when preparing for graduation examinations.

[14] The student attrition rates of the control groups in other experimental studies vary, but many of them are similar to this study, 22% percent in India (Muralidharan & Sundararaman, 2013), 24 percent in Gambia (Blimpo, Evans, & Lahire, 2015), 19.6 percent in Kenya (Duflo, Dupas, & Kremer, 2015), and 10 percent in Tanzania (Mbiti et al., 2019).

Table 2
Treatment effects on student test scores.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Overall Test Score				Math Test Score				French Test Score			
	All Grades	Grade 3	Grade 4	Grade 5	All Grades	Grade 3	Grade 4	Grade 5	All Grades	Grade 3	Grade 4	Grade 5
Grants-only	−0.055	0.011	−0.018	−0.170	0.017	0.095	0.037	−0.079	−0.119	−0.089	−0.038	−0.241*
	(0.096)	(0.123)	(0.141)	(0.140)	(0.108)	(0.133)	(0.160)	(0.175)	(0.101)	(0.135)	(0.154)	(0.139)
Grants-plus-Info	0.323***	0.467***	0.199	0.350**	0.425***	0.574***	0.353**	0.378**	0.196**	0.340**	0.064	0.259*
	(0.087)	(0.141)	(0.142)	(0.134)	(0.101)	(0.156)	(0.164)	(0.157)	(0.091)	(0.156)	(0.144)	(0.138)
Observations	3704	1276	1205	1223	3704	1276	1205	1223	3704	1276	1205	1223
R-squared	0.242	0.210	0.304	0.329	0.210	0.178	0.274	0.292	0.154	0.155	0.200	0.230
β_2-β_1	0.378***	0.456***	0.216	0.521***	0.408***	0.479***	0.316*	0.456***	0.315***	0.429***	0.101	0.500***
p-value (β_2-β_1=0)	0.000	0.001	0.195	0.000	0.000	0.001	0.096	0.008	0.004	0.006	0.558	0.001

Notes: Test scores are normalized so that the mean and standard deviation of the control group are zero and one. Overall test score is the average of the normalized test scores in math and French of each student. Regressions control for strata dummies, grade, gender, pretreatment test score, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses.

*** Significant at 1% level.

** Significant at 5% level.

* Significant at 10% level.

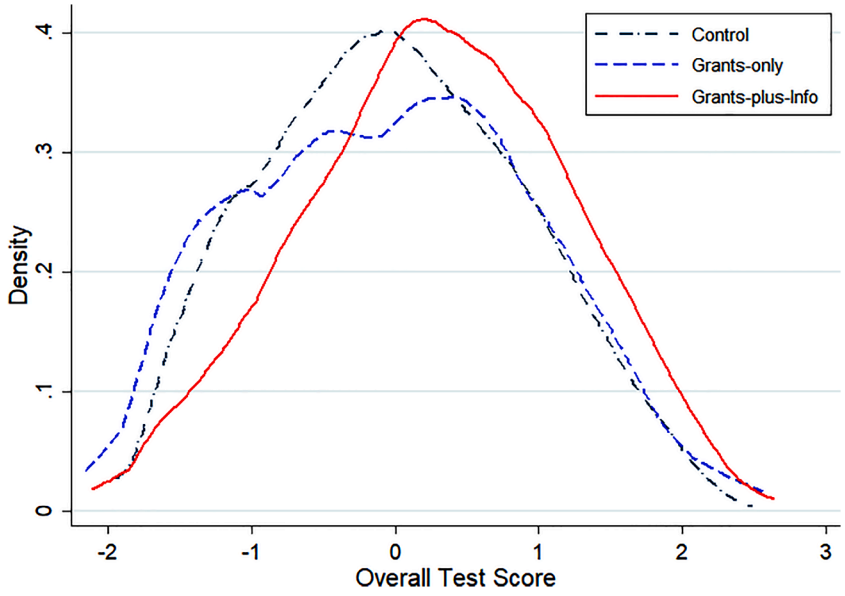

Fig. 2. Distribution of the end-line test scores.

4.2. Student test scores and perception in math and French

Table 2 reports the estimates of the effects on student test scores in math and French one and a half years after the intervention started. Fig. 2 shows the distribution of the end-line test scores among the three groups (see Fig. A1 for the distribution of the baseline test scores). Results show that, while grants alone did not improve student learning, information sharing combined with grants improved student test scores in math and French, except for fourth graders' French. The average test score of the Grants-only group students was 0.02 standard deviations higher in math and 0.12 standard deviations lower in French, relative to the control group students' test scores, and the difference is statistically insignificant. Meanwhile, the average score of the Grants-plus-Info group students was 0.43 standard deviations higher in math and 0.20 standard deviations higher in French compared to the control group students' test scores.

Table 3 estimates the program impact on student perception of learning math and French. The first and second columns show no impact on how much students liked math and French. This result is not surprising since the mean in math and French in the control group are 4.71 and 4.57 out of 5 points, respectively. That is, most of the control group students answered that they liked math and French very much; therefore, it is difficult to detect the difference across the groups.

The third and fourth columns show that while the confidence of the students in the Grants-only group did not increase, the average confidence of the students in the Grants-plus-Info group increased by 9% in both math and French, relative to the control mean of 3.30 points in math and 3.16 points in French.

4.3. School committee activities

Table 4 reports how the interventions affected school committee activities. The estimate shows that both Grants-only and Grants-plus-Info schools increased purchasing of textbooks (Column 3), school supplies (Column 4), and teacher's guides (Column 6). The estimates indicate that the proportion of Grants-only school committees that invested in textbooks, school supplies, and teacher's guides increased by 50 percentage points (representing 128%), 38 percentage points (82%), and 45 percentage points (149%), respectively, compared to the control mean. Similarly, the proportion of Grants-plus-Info school committees investing in these activities increased by 48 percentage points (124%), 38 percentage points (82%), and 49 percentage points (159%), respectively. However, the poor results on student learning in the Grants-only group suggest that these inputs alone have little impact on student learning.

The difference between the Grants-only group and the Grants-plus-

Table 3
Treatment effects on student perception of math and French.

	(1) Like math	(2) Like French	(3) Confident in math	(4) Confident in French
Grants-only	−0.039	−0.120	−0.015	−0.070
	(0.046)	(0.094)	(0.143)	(0.148)
Grants-plus-Info	0.020	0.036	0.279**	0.232*
	(0.047)	(0.082)	(0.137)	(0.136)
Observations	3704	3704	3704	3704
R-squared	0.032	0.049	0.076	0.103
Control mean	4.71	4.565	3.3	3.157
β_2-β_1	0.059	0.156**	0.294**	0.302**
p-value (β_2-β_1=0)	0.216	0.049	0.033	0.038

Notes: Columns 1/2 and 3/4 show how much students agree with the statements "I enjoy learning math/ French," and "I do well in math/ French," respectively, and the answers are coded by "5 = strongly agree," "4 = agree," "3 = neither," "2 = disagree," or "1 = strongly disagree." Regressions control for strata dummies, grade, gender, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Info group is found in activities on supplementary classes (column 8), night classes (column 9), and student awards (column 14). The estimation shows that the share of Grants-plus-Info school committees investing in supplementary classes and student awards increased by 32 percentage points (67%) and 30 percentage points (120%), respectively, compared to the control mean, while the proportion of Grants-only committees did not increase significantly. For night classes, while Grants-only committees increased by 25 percentage points (81%), Grants-plus-Info committees increased by 44 percentage points (144%). This difference between the Grants-only and the Grants-plus-Info groups is statistically significant, and the result is robust to the regression without control variables (see Table A3 in the Appendix). The high performance of student learning at the Grants-plus-Info schools may be partly attributed to these activities.[15]

4.4. Student effort

Table 5 shows how students' studying patterns changed after the intervention. The results indicate that the Grants-plus-Info group increased student study hours and family's support for children's studies. The first and the second columns show that the Grants-plus-Info group increased student attendance in supplementary and night classes by 22 percentage points (108%) and 20 percentage points (73%) relative to the control mean, respectively, and are consistent with the results of school committee activities in Table 6, where the Grants-plus-Info increased support for these classes. The third column shows that the Grants-plus-Info group increased student home study by 0.43 h per day (31%) relative to the control mean of 1.39 h. The fourth column shows the proportion of students receiving help from their family members with their studies at home. The result indicates that the Grants-plus-Info families were 8 percentage points (18%) more likely to support student study than the control mean of 43%.[16]

On the other hand, the Grants-only group had an insignificant impact on these measures. Among them, the increase in participation in night classes is relatively high (7 percentage points or 24% increase compared to the control mean); however, this increase is much smaller than the increase in school committees' investment in night classes (25 percentage points or 81% increase) shown in Table 4. These results suggest that the Grants-only students were not as engaged in after-school leaning as the Grants-plus-Info students.

4.5. Parental effort

Table 6 displays how much parents contributed to and participated in school committee activities and were engaged in their children's education. As with student effort, the results show that the Grants-plus-Info group had significant effects on several measures, while the Grants-only group had insignificant effects on all measures. The first column shows how much a parent contributed on average to a school committee in FCFA. The estimate shows that Grants-plus-Info parents increased their contribution by FCFA 518, or 80% of the control mean. The second column shows the parental participation rate in the community meetings, which were organized by school committees four times a year. The result shows that the average attendance rate of Grants-plus-Info parents increased by 0.29 times (13%) compared to the control mean of 2.22 times per year.

In the interview survey, parents were asked whether they received test scorecards from their children's school, and, if yes, whether they discussed the performance with their children and teachers. The third column shows that Grants-plus-Info parents who discussed the results with their children increased by 9 percentage points (11%) compared to the control mean of 76%.The fourth column shows that Grants-plus-Info parents who discussed with teachers increased by 5 percentage points (7%) compared to the control mean of 69%, although the difference is not statistically significant.

We also asked parents whether their children could read and/or write in French, and checked its consistency with their children's test score. In addition to parents who answered that they did not know their children's skills, those who answered that their children could speak (or read) French but whose children received zeroes on their speaking (or reading) scores were considered not to understand their children's skills correctly. The fifth column shows that the understanding of Grants-plus-Info parents improved by 5 percentage points (13%) compared to the control mean of 42%, but the difference was not significant. In addition, more than half of all Grants-plus-Info parents misunderstood their children's skills. This could be because the intervention provided information to parents on average student performance and not individual student performance.

The results of student effort (Table 5) and parent effort (Table 6) suggest that Grants-plus-Info parents were more interested in their children's learning and encouraged them to study after school.

4.6. Teacher and school committee efforts

Table 7 shows changes in the efforts of teachers and school committee members. Columns 1 and 2 show that while teacher absence rate did not change after the interventions, Grants-plus-Info teachers who supported extracurricular classes increased by 33 percentage points (74%) compared to the control mean of 45%. These results are consistent with Table 6, which shows that Grants-plus-Info committees did not increase monitoring teacher attendance but did increase support for supplementary and night classes, for which teachers were often paid by a school committee.

The third column shows that the frequency of meetings of Grants-only and Grants-plus-Info committees increased by 0.9 times and 1.5 times, respectively, compared to the control mean of 3.6 times per year. These increases may reflect greater responsibilities and activities of these two group committees.

[15] Among various types of interventions, providing supplementary and night classes is similar to an extra-time program. Snilstveit et al. (2016) suggest that this type of intervention is promising for improving students' learning, although their results are based on the analysis of only two studies.

[16] According to our survey data, considering the entire sample at the end-line survey, 63% of students were helped by their siblings, 10% by their mothers, 9% by their fathers, and 18% by their relatives. This tendency is similar among groups.

Table 4
Treatment effects on school committees' activities.

	(1) Build or repair classrooms	(2) Make or purchase school furniture	(3) Purchase textbooks	(4) Purchase school supplies	(5) Support teacher training	(6) Purchase teacher's guides	(7) Encourage parents to send their children to school
Grants-only	0.073	0.084	0.501***	0.376***	0.047	0.453***	−0.016
	(0.080)	(0.054)	(0.075)	(0.079)	(0.074)	(0.081)	(0.092)
	[0.426]	[0.188]	[0.001]	[0.001]	[0.588]	[0.001]	[0.703]
Grants-plus-Info	0.105	0.063	0.483***	0.375***	0.023	0.486***	−0.050
	(0.078)	(0.050)	(0.080)	(0.080)	(0.071)	(0.083)	(0.091)
	[0.290]	[0.313]	[0.001]	[0.001]	[0.679]	[0.001]	[0.589]
Observations	179	179	179	179	179	179	179
R-squared	0.104	0.090	0.309	0.236	0.095	0.279	0.127
Control mean	0.712	0.051	0.390	0.458	0.169	0.305	0.559
β_2-β_1	0.031	−0.022	−0.017	−0.000	−0.024	0.033	−0.034
p-value (β_2-β_1=0)	0.675	0.719	0.780	0.995	0.747	0.668	0.706

	(8) Implement supplementary classes	(9) Implement night classes	(10) Support individual student study	(11) Monitor student attendance	(12) Monitor teacher attendance	(13) Conduct practice exam	(14) Award students who had excellent performance
β_1: Grants-only	0.078	0.248***	0.104	−0.033	−0.075	0.010	0.072
	(0.088)	(0.085)	(0.063)	(0.089)	(0.090)	(0.070)	(0.080)
	[0.426]	[0.008]	[0.169]	[0.677]	[0.435]	[0.703]	[0.426]
β_2: Grants-plus-Info	0.320***	0.438***	0.147**	−0.093	−0.013	0.010	0.304***
	(0.083)	(0.084)	(0.066)	(0.089)	(0.089)	(0.068)	(0.084)
	[0.001]	[0.001]	[0.047]	[0.390]	[0.703]	[0.703]	[0.001]
Observations	179	179	179	179	179	179	179
R-squared	0.143	0.235	0.099	0.140	0.147	0.129	0.229
Control mean	0.475	0.305	0.085	0.559	0.508	0.169	0.254
β_2-β_1	0.242***	0.190**	0.043	−0.060	0.062	−0.000	0.231***
p-value (β_2-β_1=0)	0.003	0.024	0.546	0.508	0.481	0.997	0.006

Notes: Each column shows the proportion of school committees that supported or conducted the corresponding activity. Regressions control for strata dummies, whether a school is located in a rural or urban area, and whether the committee supported the activity before the treatment. Robust standard errors are in parentheses. [.] show sharpened two-stage q-values that control the False Discovery Rate with 28 outcomes in the table. The total number of observations is 179 (one observation is missing) because we were not able to interview one of the school committees in the control group at the end-line survey. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table 5
Treatment effects on students' studying pattern.

	(1) Attend supplementary classes	(2) Attend night classes	(3) Study hours at home	(4) Family helps student study
β_1: Grants-only	0.044	0.067	0.027	−0.041
	(0.050)	(0.057)	(0.136)	(0.043)
β_2: Grants-plus-Info	0.220***	0.201***	0.433***	0.079*
	(0.060)	(0.059)	(0.147)	(0.041)
Observations	3704	3704	3444	3704
R-squared	0.144	0.166	0.062	0.107
Control mean	0.203	0.274	1.389	0.434
β_2-β_1	0.176***	0.134**	0.406***	0.120***
p-value (β_2-β_1=0)	0.003	0.017	0.005	0.004

Notes: Columns 1 and 2 show the proportion of students who attended supplementary and night classes, respectively. Column 3 shows how many hours a student studies at home on average. Column 4 shows the proportion of students who are helped by their family members in their studies. Regressions control for strata dummies, grade, gender, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses.
*** Significant at 1% level.
** Significant at 5% level.
* Significant at 10% level.

4.7. Heterogeneous impact by baseline test scores

Table 8 presents the heterogeneous impact on student test scores, by dividing the students into quintiles based on the average test scores at the baseline survey. The effect of the Grants-plus-Info is largest for the lowest-performing children (0.65 standard deviations), and is positive and statistically significant for both the second lowest-performing children (0.32 standard deviations) and the middle-performing children (0.28 standard deviations). Although the effect is also positive for the second-highest children (0.22 standard deviations), it is relatively small. There was no effect for the highest-performing children.

Table 9 shows the heterogeneous effects on students' confidence in math and French by the baseline test score quintile. In contrast to the test scores, the effects on children's confidence in the lowest-performing group was the smallest across quintiles, whereas the effects were relevant for the second lowest-performing children and the middle-performing children. These results suggest that students' confidence increased as they acquired basic skills, but that more progress may be necessary for the lowest-performing children to increase their confidence.

Table 6
Treatment effects on parental effort.

	(1) Contribution to committee (FCFA)	(2) Attendance to committee meeting	(3) Discuss with child	(4) Discuss with teacher	(5) Understanding of children's skill
β_1: Grants-only	146.441	0.110	0.036	0.004	0.008
	(235.308)	(0.113)	(0.043)	(0.049)	(0.037)
β_2: Grants-plus-Info	518.420*	0.291**	0.086**	0.048	0.052
	(295.841)	(0.117)	(0.040)	(0.041)	(0.042)
Observations	1688	1934	1648	1648	1987
R-squared	0.067	0.108	0.066	0.067	0.037
Control mean	1752.134	2.216	0.758	0.686	0.415
β_2-β_1	371.979	0.181*	0.050	0.045	0.048
p-value (β_2-β_1=0)	0.215	0.091	0.217	0.328	0.203

Notes: Column 1 shows how much a parent contributed to a school committee in FCFA on average. Column 2 shows how many times a parent attended a school committee meeting in a year (held four times in a year). Columns 3 and 4 show whether a parent discusses their children's performance with them and their teachers, respectively. Column 5 shows whether a parent understands children's reading and writing skills correctly. Regressions control for strata dummies, relationship to a student, student grade, student gender, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses.
***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table 7
Treatment effects on teacher and school committee efforts.

	(1) Teacher absence	(2) Teacher instructs additional classes	(3) Frequency of committee member meetings
β_1: Grants-only	−0.016	0.100	0.895*
	(0.301)	(0.067)	(0.468)
β_2: Grants-plus-Info	−0.192	0.334***	1.495***
	(0.302)	(0.065)	(0.479)
Observations	313	315	178
R-squared	0.087	0.204	0.144
Control mean	1.039	0.452	3.644
β_2-β_1	−0.177	0.234***	0.600
p-value (β_2-β_1=0)	0.503	0.000	0.188

Notes: Column 1 shows how many days a teacher was absent in the previous week on average based on an interview with the teacher. Column 2 shows whether a teacher instructed supplementary or night classes in addition to regular classes. Columns 3 shows how many times committee members held meetings in the school year. Regressions control for strata dummies, relationship to a student, student grade, student gender, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses.
***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table 8
Heterogeneous effects on student test scores.

	(1) Overall Test Score Quintile 1	(2) Quintile 2	(3) Quintile 3	(4) Quintile 4	(5) Quintile 5
β_1: Grants-only	0.131	−0.081	−0.141	−0.063	−0.230
	(0.120)	(0.123)	(0.123)	(0.109)	(0.154)
β_2: Grants-plus-Info	0.649***	0.315***	0.280**	0.222*	−0.001
	(0.129)	(0.119)	(0.109)	(0.113)	(0.144)
Observations	692	728	746	766	772
R-squared	0.224	0.122	0.136	0.094	0.164
Control mean	−0.703	−0.283	−0.099	0.197	0.724
β_2-β_1	0.518***	0.396***	0.421***	0.284**	0.230
p-value (β_2-β_1=0)	0.000	0.003	0.003	0.019	0.133
p-value (equality of β_2)	0.012				

Notes: Students are divided by quintile of the baseline test scores, from lowest (Quintile 1) through highest (Quintile 5) at each grade. Overall test score is the average of the normalized test scores in math and French of each student, and results are aggregated over three grades. Regressions control for strata dummies, grade, gender, pretreatment test score, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses. "p-value (equality of β_2)" shows the p-value of a Chow test of equality of β_2 across quintiles.
*** Significant at 1% level.
** Significant at 5% level.
* Significant at 10% level.

To explore the reason for the heterogenous impact on student test scores, Table 10 displays the effects on children's study behavior by the same quintiles. Looking at the mean of the control group of panel A-D, the higher-performing children tend to attend more supplementary and night classes, study more at home, and their families tend to help them with home study. The estimates suggest that information sharing induced lower-performing children to attend more classes and study more at home and their families to support the children's home study. These behavioral responses can explain the improvement in the test scores of low-performing children.

4.8. Attrition

Table 11 presents the effects on student attrition. The results suggest that the Grants-only and the Grants-plus-Info groups decreased their attrition rate by 3 percentage points and 4 percentage points,

Table 9
Heterogeneous effects on student confidence.

	(1)	(2)	(3)	(4)	(5)
	Student confidence in math and French (average)				
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
β_1: Grants-only	−0.021	−0.012	−0.038	−0.144	0.030
	(0.223)	(0.176)	(0.172)	(0.180)	(0.210)
β_2: Grants-plus-Info	0.160	0.395**	0.362**	0.196	0.227
	(0.205)	(0.166)	(0.176)	(0.180)	(0.212)
Observations	688	720	741	760	762
R-squared	0.189	0.144	0.119	0.127	0.143
Control mean	2.894	3.084	3.039	3.348	3.693
β_2-β_1	0.181	0.406**	0.400**	0.340*	0.197
p-value (β_2-β_1=0)	0.410	0.012	0.044	0.076	0.280
p-value (equality of β_2)	0.673				

Notes: Students are divided by quintile of the baseline test scores, from lowest (Quintile 1) through highest (Quintile 5) at each grade. Student confidence is the average of confidence in math and French. Regressions control for strata dummies, grade, gender, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses. "p-value (equality of β_2)" shows the p-value of a Chow test of equality of β_2 across quintiles. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

respectively. Looking at the results by quintile based on the baseline test score, the attrition is higher for low-performing children in all groups, but it is not clear whether the effect of the interventions on attrition is stronger for low-performing children.

The lower absence rate itself can be a positive outcome of the intervention, but it may bias the estimations of other outcomes, including student test scores since student data is unlikely to be missing at random. To address this sample selection bias, I use Lee (2009)'s methodology that computes the smallest and largest possible treatment effects by trimming the upper and lower tails of the outcome (in this study, test score) distribution by the number of individuals who are induced to be selected (in this study, the number of students who are induced to attend the end-line test) because of the treatment. This method relies on the monotonicity assumption, where the intervention can only affect sample selection in "one direction." In this study, it is reasonable to assume that the intervention increased student attendance and does not cause student absences. Table 12 shows the estimated upper and lower bounds for each treatment effect on test scores, using the quintile of baseline test scores as a covariate to tighten the bounds (see Table A4 in the Appendix for the Lee bounds estimate without the covariate). Looking at the overall test scores for the Grants-only group, the lower bound is −0.094 standard deviations, and the upper bound is 0.026 standard deviations, suggesting that the impact of school grants alone on the test scores is minimal even if the lower tail of the Grants-only school student is trimmed. For the Grants-plus-Info group, even the lower bound of the overall score is 0.25 standard deviations, which is above zero at the 99% confidence level, suggesting that results are robust to controlling for the attrition.

4.9. Cost-effectiveness

This section analyzes the cost-effectiveness of the Grants-plus-Info program (information sharing combined with grants) and compares it with other education programs in Africa, utilizing the methodology proposed by Dhaliwal, Duflo, Glennerster and Tulloch (2013). The total cost per student was US$ 14.77, which includes (i) training and monitoring for school committee members (US$ 4.93); (ii) staff salaries (US$ 0.73); (iii) community contributions (US$ 0.35); (iv) communities' opportunity cost to attend meetings (US$ 0.14); and (v) grants (US$ 8.62). Using this calculation, I estimate that the cost of increasing the test scores by 0.1 standard deviations per student is US$ 5.03 (overall), US$ 3.82 (Math), and US$ 8.29 (French).

This suggests that the Grants-plus-Info program is more cost-effective than certain education programs in Africa, while there are other programs, such as teacher incentive programs, that demonstrate better results.[17] For example, a conditional cash transfer program in Malawi costs US$ 166.74 (Baird, McIntosh & Özler, 2011), and a girls scholarship program in Kenya costs US$ 7.23 (Kremer, Miguel & Thornton, 2009). On the contrary, a teacher incentive program in Kenya amounts to US$ 1.59 (Glewwe, Ilias & Kremer 2010), a teacher incentive program combined with grant provision in Malawi costs US$3.69, and a teacher incentive program (alone) in Malawi utilizes US$3.38 (Mbiti et al., 2019) to increase test scores by 0.1 standard deviations.[18][19]

5. Conclusion

This study examined the impact of school grants and information sharing for parents and communities to increase their awareness of student learning and improve resource utilization. The study finds that providing monetary grants alone has a limited impact on student performance. School grants were utilized to purchase textbooks, school supplies, and teacher's guides, but these inputs may not have been utilized effectively when communities have little knowledge of learning outcomes. This result is consistent with previous studies, which found that providing school inputs such as monetary grants, textbooks, or teaching materials is insufficient to improve learning. However, by providing communities with information in addition to grants, as well as facilitating discussions on how communities and schools can work

[17] The comparison between different programs in terms of cost-effectiveness is useful in assessing policy; however, as Kremer, Brannen, and Glennerster (2013) noted, this should be considered as one input among others, as the goals of interventions and the meaning of a standard deviation may differ in different experiments.

[18] For information about the cost-effectiveness calculations of the conditional cash transfer program in Malawi, the girls scholarship program in Kenya, and the teacher incentive program in Kenya, I referred to the data found in Bhula, Mahoney, and Murphy (2020) article.

[19] The cost-effectiveness of the teacher incentive programs shown above were based on the results of high-stakes tests that were linked to teacher rewards. However, when the tests were not linked to teacher rewards, the results of the programs became weaker: in Malawi especially, teacher incentives alone had no impact, whereas teacher incentives with grants had positive impact, and the program cost US$ 5.78 to increase test scores by 0.1 standard deviations per person (Mbiti et al., 2019).

Table 10
Heterogeneous effects on students' studying pattern.

	(1) Quintile 1	(2) Quintile 2	(3) Quintile 3	(4) Quintile 4	(5) Quintile 5
Panel A: Attend Supplementary Classes					
β_1: Grants-only	0.131*	0.051	0.083	0.015	0.003
	(0.072)	(0.073)	(0.062)	(0.072)	(0.070)
β_2: Grants-plus-Info	0.321***	0.256***	0.202***	0.181**	0.167**
	(0.084)	(0.083)	(0.073)	(0.081)	(0.080)
Observations	692	728	746	766	772
R-squared	0.302	0.154	0.202	0.123	0.233
Control mean	0.145	0.168	0.152	0.266	0.270
β_2-β_1	0.190**	0.205***	0.120	0.165**	0.164**
p-value (β_2-β_1=0)	0.050	0.005	0.108	0.022	0.037
p-value (equality of β_2)	0.746				
β_2-β_1	0.190**	0.205***	0.120	0.165**	0.164**
Panel B: Attend Night Classes					
β_1: Grants-only	0.147*	0.092	0.130**	0.025	−0.011
	(0.076)	(0.066)	(0.064)	(0.070)	(0.100)
β_2: Grants-plus-Info	0.343***	0.238***	0.247***	0.177***	0.080
	(0.084)	(0.067)	(0.071)	(0.066)	(0.104)
Observations	692	728	746	766	772
R-squared	0.195	0.195	0.208	0.245	0.231
Control mean	0.174	0.214	0.213	0.329	0.414
β_2-β_1	0.196**	0.146*	0.117	0.152**	0.091
p-value (β_2-β_1=0)	0.033	0.050	0.102	0.023	0.231
p-value (equality of β_2)	0.325				
Panel C: Study Hours at Home					
β_1: Grants-only	0.075	−0.219	0.217	0.079	−0.025
	(0.205)	(0.164)	(0.176)	(0.211)	(0.228)
β_2: Grants-plus-Info	0.507**	0.353**	0.665***	0.247	0.337
	(0.248)	(0.173)	(0.218)	(0.211)	(0.273)
Observations	658	691	688	705	702
R-squared	0.101	0.112	0.123	0.125	0.140
Control mean	1.263	1.310	1.160	1.529	1.642
β_2-β_1	0.433	0.572***	0.448**	0.169	0.362
p-value (β_2-β_1=0)	0.132	0.001	0.033	0.412	0.145
p-value (equality of β_2)	0.427				
Panel D: Family Helps Student Study					
β_1: Grants-only	−0.009	−0.010	−0.061	−0.044	−0.076
	(0.071)	(0.068)	(0.062)	(0.057)	(0.069)
β_2: Grants-plus-Info	0.218***	0.072	0.056	0.066	0.009
	(0.070)	(0.061)	(0.054)	(0.060)	(0.065)
Observations	692	728	746	766	772
R-squared	0.122	0.090	0.168	0.144	0.182
Control mean	0.372	0.391	0.451	0.447	0.492
β_2-β_1	0.227***	0.082	0.117**	0.109*	0.085
p-value (β_2-β_1=0)	0.000	0.209	0.042	0.050	0.149
p-value (equality of β_2)	0.210				

Notes: Students are divided by quintile of the baseline test scores, from lowest (Quintile 1) through highest (Quintile 5) at each grade. Panel A and B shows whether a child attends supplementary and night classes, respectively. Panel C shows how many hours a student studies at home per day. Panel D shows whether a student is supported by family members in their home study. Regressions control for strata dummies, grade, gender, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses. "p-value (equality of β_2)" shows the p-value of a Chow test of equality of β_2 across quintiles.

*** Significant at 1% level.
** Significant at 5% level.
* Significant at 10% level.

together utilizing the grants and communities' own resources, student test scores improved by 0.43 standard deviations in math and 0.20 standard deviations in French. The impact was strongest for the lowest-performing children.

Compared to other educational interventions that have been tested in developing countries, the effect sizes of the Grants-plus-Info program in Niger are fairly large in improving learning (see McEwan [2015] and Snilstveit et al. [2016] for reviews of other interventions). A possible reason for this large impact is that the information-sharing intervention activated several channels that enhanced student learning. First, communities realized that most children were not learning the minimum at school, and they increased their contribution to school committee activities. Second, school committees, communities, and parents gained practical knowledge about learning and promoted activities to improve students' learning, such as supplementary and night classes. Third, parents took more interest in their children's education; they encouraged them to attend supplementary and night classes, and provided more support for learning at home.

Several policy implications can be drawn from this study. First, the weakness of the school grant program described in the introduction can be mitigated by a complementary intervention. Even when communities do not have enough capacity, school inputs can be effectively utilized by sharing information on improving learning. Also, reducing parental effort in response to school inputs can be mitigated by raising awareness of their children's learning.

Second, communities and parents can have a more active role in improving student learning than expected based on previous literature about information interventions. As Mbiti (2016) notes, providing parents with information about school quality may be insufficient to improve student learning when schools face a variety of challenges and parents have limited opportunities to influence the education system. Recognizing this limitation, the intervention in Niger encouraged

Table 11
Effects on student attrition.

	(1) Attrition rate All	(2) Quintile 1	(3) Quintile 2	(4) Quintile 3	(5) Quintile 4	(6) Quintile 5
Grants-only	−0.032*	−0.001	−0.069**	−0.037	−0.046	−0.000
	(0.017)	(0.040)	(0.034)	(0.032)	(0.032)	(0.031)
Grants-plus-Info	−0.039**	0.003	−0.070**	−0.051	−0.053*	−0.039
	(0.018)	(0.042)	(0.033)	(0.032)	(0.028)	(0.030)
Observations	4488	902	899	893	898	896
R-squared	0.017	0.045	0.031	0.042	0.025	0.056
Control mean	0.196	0.239	0.236	0.187	0.181	0.143
β_2-β_1	−0.007	0.003	−0.001	−0.014	−0.008	−0.039
p-value (β_2-β_1=0)	0.688	0.929	0.968	0.676	0.763	0.220
p-value (equality of β_2)		0.619				

Notes: Students are divided by quintile of the baseline test scores, from lowest (Quintile 1) through highest (Quintile 5), and are aggregated over all grades. Regressions control for strata dummies, grade, gender, and whether a school is located in a rural or urban area. Robust standard errors are clustered at the school level and are in parentheses. "p-value (equality of β_2)" shows the p-value of a Chow test of equality of β_2 across quintiles.
***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table 12
Lee bounds for treatment effects on student test scores.

	(1) Overall Lower bound	(2) Upper bound	(3) Math Lower bound	(4) Upper bound	(5) French Lower bound	(6) Upper bound	(7) N before trimming	(8) Trimming proportion
Grants-only	−0.094*	0.026	−0.049	0.085	−0.149**	−0.012	2948	0.0338
	(0.056)	(0.054)	(0.061)	(0.059)	(0.059)	(0.058)		
Grants-plus-Info	0.247***	0.409***	0.342***	0.513***	0.136**	0.284***	2988	0.0425
	(0.050)	(0.050)	(0.054)	(0.056)	(0.055)	(0.056)		

Notes: Lower and upper bound estimates by trimming upper and lower tail in each treatment group (see text for details), using a method proposed by Lee (2009). The dependent variable is the normalized test score so that the mean and standard deviation of the control group are zero and one. Overall test score is the average of the normalized test scores in math and French of each student. Quintile of baseline test scores is used as a covariate to tighten bounds. Standard errors are in parentheses.
*** Significant at 1% level.
** Significant at 5% level.
* Significant at 10% level.

communities and parents to work with schools and paved the way through a series of activities in which communities and parents gained practical knowledge, discussed how they could work collaboratively with schools, and took concrete action for student learning. One caveat is that the intervention in this study was not enough for parents to understand their own children's skills, since the intervention shared information on average student performance rather than individual performance. For parents to properly understand their children's performance, another intervention or an additional component may be needed to provide individualized information directly to parents.[20] However, since it may be more expensive, its cost-effectiveness should be taken into account when introducing this type of intervention. Further studies are necessary to establish what approach is more effective in improving student learning.

Third, although the information-sharing intervention tested in this study can be useful in addressing the learning crisis in the developing world, there are several limitations when the intervention is scaled up nationwide and implemented in other countries. First, without a functioning school committee, this intervention may not lead to the expected results. In Niger, school committees worked effectively in empowering communities and parents. If existing school committees do not have that capacity, additional intervention to strengthen them may be necessary. Second, as discussed in the introduction, it is unclear how effective it would be when the information-sharing intervention is implemented separately without grants because there can be complementarities between the grants and the information-sharing intervention. Moreover, this intervention alone may face limitations as community and parental awareness increases and children's overall learning levels advance since its effects are relatively weak for higher-performing children. Various factors hinder children's learning; therefore, any one solution is not enough to overcome the formidable learning challenges in the developing world. We need to exert continuous efforts to accumulate new evidence and better utilize the findings to fight the learning crisis.

[20] Some experimental studies provide individualized information to parents. For example, Dizon-Ross (2019) conducted a field experiment in Malawi informing parents of their children's academic performance verbally in a clear way, which made parents update their beliefs about their children's performance and adjust their investments in their children's education.

Authors' statement

Eiji Kozuka: Conceptualization, Methodology, Software, Data curation, Writing

Funding

This research was funded by JICA Ogata Sadako Research Institute for Peace and Development. It has been prepared as a part of its research project titled "Impact Evaluation Analyses for the JICA Projects."

Declaration of Competing Interest

The author is a staff member of the Japan International Cooperation Agency (JICA). He declares no conflict of interest. The content of this paper is independent from JICA's policies or organizational views.

Data availability

Data will be made available on request.

Acknowledgments

I appreciate Masahiro Hara and Akiko Kageyama for their strong initiative and intensive support in implementing the intervention. I also thank Eriko Yagi and Iddresa Kabore for their excellent support in collecting and managing the data. I appreciate the valuable comments from the editor and four referees, as well as Moussa Blimpo, Deon Filmer, Akio Hosono, Shin-ichi Ishihara, Emannuel Jimenez, Haruko Kamei, Hiroshi Kato, Naohiro Kitano, Nobuhiro Kunieda, Takao Maruyama, Halsey Rogers, and Yasuyuki Sawada.

Appendix

Fig. A1, Tables A1, A2, A3, A4 and A5

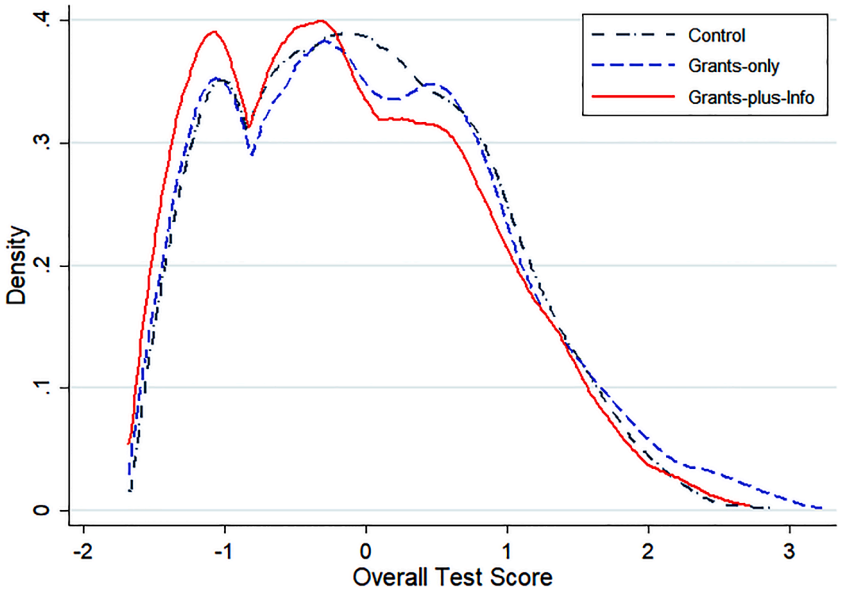

Fig. A1. Distribution of the baseline test scores.

Table A1
Treatment effects on student test scores without controls.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Overall Test Score				Math Test Score				French Test Score			
	All Grades	Grade 3	Grade 4	Grade 5	All Grades	Grade 3	Grade 4	Grade 5	All Grades	Grade 3	Grade 4	Grade 5
β_1: Grants-only	−0.031	−0.027	0.104	−0.148	0.026	0.054	0.192	−0.136	−0.088	−0.108	0.016	−0.160
	(0.108)	(0.132)	(0.169)	(0.143)	(0.119)	(0.141)	(0.181)	(0.175)	(0.109)	(0.142)	(0.177)	(0.143)
β_2: Grants-plus-Info	0.285***	0.418***	0.288*	0.232*	0.395***	0.528***	0.453***	0.305*	0.174*	0.308*	0.123	0.159
	(0.095)	(0.141)	(0.147)	(0.138)	(0.104)	(0.153)	(0.161)	(0.167)	(0.100)	(0.156)	(0.154)	(0.139)
Observations	3704	1276	1205	1223	3704	1276	1205	1223	3704	1276	1205	1223
R-squared	0.068	0.102	0.079	0.133	0.067	0.093	0.098	0.132	0.051	0.084	0.056	0.106
β_2-β_1	0.316***	0.445***	0.184	0.380***	0.369***	0.474***	0.262	0.441**	0.262**	0.416***	0.107	0.319**
p-value (β_2-β_1=0)	0.004	0.002	0.311	0.008	0.002	0.001	0.195	0.012	0.018	0.010	0.565	0.019

Notes: Test scores are normalized so that the mean and standard deviation of the control group are zero and one. Overall test score is the average of the normalized test scores in math and French of each student. All regressions control for strata dummies. Robust standard errors are clustered at the school level and are in parentheses.
*** Significant at 1% level.
** Significant at 5% level.
* Significant at 10% level.

Table A2
Treatment effects on student perception on Math and French without controls.

	(1)	(2)	(3)	(4)
	Like math	Like French	Confident in math	Confident in French
Grants-only	−0.040	−0.120	−0.015	−0.070
	(0.047)	(0.094)	(0.143)	(0.148)
Grants plus Info-only	0.024	0.036	0.279**	0.232*
	(0.047)	(0.082)	(0.137)	(0.136)
Observations	3704	3704	3704	3704
R-squared	0.030	0.054	0.083	0.109
Control mean	4.71	4.565	3.3	3.157
β_2-β_1	0.064	0.160**	0.308**	0.325**
p-value (β_2-β_1=0)	0.187	0.044	0.026	0.028

Notes: Columns 1/2 and 3/4 show how much students agree with the statements "I enjoy learning mathematics/ French," and "I do well in mathematics/ French," respectively, and the answers are coded by "5 = strongly agree," "4 = agree," "3 = neither," "2 = disagree," or "1 = strongly disagree." Regressions control for strata dummies. Robust standard errors are clustered at the school level and are in parentheses.
***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table A3
Treatment effects on school committees' activities without controls.

	(1) Build or repair classrooms	(2) Make or purchase school furniture	(3) Purchase textbooks	(4) Purchase school supplies	(5) Support teacher training	(6) Purchase teacher's guidebooks	(7) Encourage parents to send their children to school
Grants-only	0.068	0.085	0.508***	0.373***	0.042	0.458***	−0.034
	(0.079)	(0.053)	(0.075)	(0.079)	(0.074)	(0.081)	(0.090)
	[0.442]	[0.161]	[0.001]	[0.001]	[0.546]	[0.001]	[0.667]
Grants-plus-Info	0.101	0.068	0.475***	0.373***	0.026	0.491***	−0.068
	(0.077)	(0.051)	(0.079)	(0.081)	(0.070)	(0.082)	(0.090)
Observations	179	179	179	179	179	179	179
R-squared	0.104	0.083	0.309	0.236	0.095	0.273	0.121
Control Mean	0.712	0.051	0.390	0.458	0.169	0.305	0.559
β_2-β_1	0.033	−0.017	−0.033	−0.000	−0.017	0.033	−0.033
p-value (β_2-β_1=0)	0.654	0.785	0.577	1.000	0.821	0.658	0.711

	(8) Implement supplemental classes	(9) Implement night classes	(10) Support individual student study	(11) Monitor student attendance	(12) Monitor teacher attendance	(13) Conduct practice exam	(14) Award students who had excellent performance
β_1: Grants-only	0.087	0.273***	0.085	−0.034	−0.067	0.009	0.087
	(0.091)	(0.085)	(0.062)	(0.088)	(0.090)	(0.070)	(0.078)
	[0.442]	[0.008]	[0.161]	[0.643]	[0.46]	[0.666]	[0.442]
β_2: Grants-plus-Info	0.320***	0.439***	0.135**	−0.084	−0.001	0.025	0.303***
	(0.084)	(0.084)	(0.064)	(0.089)	(0.088)	(0.070)	(0.085)
	[0.001]	[0.001]	[0.050]	[0.442]	[0.758]	[0.643]	[0.001]
Observations	179	179	179	179	179	179	179
R-squared	0.139	0.233	0.093	0.134	0.146	0.099	0.229
Control mean	0.475	0.305	0.085	0.559	0.508	0.169	0.254
β_2-β_1	0.233***	0.167**	0.050	−0.050	0.067	0.017	0.217**
p-value (β_2-β_1=0)	0.007	0.046	0.493	0.582	0.454	0.816	0.011

Notes: Each column shows the proportion of school committees that supported or conducted the corresponding activity. Regressions control for strata dummies, whether a school is located in a rural or urban area, and whether the committee supported the activity before the treatment. Robust standard errors are in parentheses. [.] show sharpened two-stage q-values that control the False Discovery Rate with 28 outcomes in the table. The total number of observations is 179 (one observation is missing) because we were not able to interview with a school committee of the control group at the end-line survey.
***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table A4
Lee Bounds for treatment effect on student test scores without covariate.

	(1) Overall Lower bound	(2) Upper bound	(3) Math Lower bound	(4) Upper bound	(5) French Lower bound	(6) Upper bound	(7) N before trimming	(8) Trimming proportion
Grants-only	−0.100**	0.039	−0.060	0.095*	−0.156***	−0.008	2948	0.0338
	(0.051)	(0.050)	(0.056)	(0.056)	(0.055)	(0.056)		
Grants-plus-Info	0.212***	0.374***	0.310***	0.480***	0.096*	0.273***	2988	0.0418
	(0.047)	(0.048)	(0.051)	(0.052)	(0.051)	(0.052)		

Notes: Lower and upper bound estimates by trimming upper and lower tail in each treatment group (see text for details), using a method proposed by Lee (2009). The dependent variable is normalized test score so that the mean and standard deviation of the control group are zero and one. Overall test score is the average of the normalized test scores in math and French of each student. Standard errors are in parentheses.
*** Significant at 1% level.
** Significant at 5% level.
* Significant at 10% level.

Table A5
Cost per student to implement the interventions.

	Cost per student (US$) Total cost	Training & monitoring	Staff salaries	Communities' contribution	Communities' opportunity cost	Grants
Grants-only	11.26	2.60	0.38	0.05	0.09	8.15
Grants-plus-Info	14.77	4.93	0.73	0.35	0.14	8.62

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