

School Leaders' and Teachers' Preparedness to Support Education in Rwanda during the COVID-19 Emergency

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SCHOOL LEADERS' AND TEACHERS' PREPAREDNESS TO SUPPORT EDUCATION IN RWANDA DURING THE COVID-19 EMERGENCY

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ABSTRACT

Due to the COVID-19 pandemic, all Rwandan schools were closed in March 2020; they started to reopen in November 2020. To understand the Rwandan schools' level of preparedness to teach remotely during this unprecedented emergency, and for the eventual return to school, we conducted phone surveys with school leaders and teachers in 298 secondary schools in August 2020. Drawing from knowledge mobilization theory and quantitative data, our results indicate that there were gaps in school leaders' and teachers' access to technology and training, and a lack of preparedness that could inform policy and practice in future emergencies. Our findings reveal that, before the pandemic, the male teachers in Rwanda had more access than the female teachers to both technological devices and online experience, and that the teachers from well-resourced schools were more likely than teachers from regular schools to own some kind of device to use for teaching. We found that the teachers whose school leaders had received guidance on how to continue education during the school closures were more likely to receive their support. Two additional findings were that younger teachers were more likely than the older ones to support their students during the school closures, and that the school leaders and teachers we surveyed believed that students from low-income families and rural areas benefitted the least from remote learning. These findings indicate that, in Rwanda, the level of preparedness to support schooling during the COVID-19 emergency was negatively affected by preexisting and ongoing inequalities in access to both material and nonmaterial resources.

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INTRODUCTION

The COVID-19 pandemic has been recognized as “an emergency of an unprecedented scale” (INEE 2020a). In reaction to the emergency and to limit transmission of the virus, countries around the world closed their schools. After the first COVID-19 case was diagnosed in Rwanda, the government announced that all schools would close; more than 700,000 secondary students stopped going to school on March 14, 2020 (Miks and McIlwaine 2020; Ministry of Education 2019). The schools remained closed until November 2020, when the upper primary and secondary schools began to reopen in phases (Ministry of Education 2020c). At the time of reopening, the start of the school calendar year was temporarily shifted from September to June, and the students were expected to return to the grade they were in before schools closed; in effect, they would start the school year over and repeat the first part of it.

School closings across the globe caused concern that unequal access to technology would affect some students' ability to continue their education, and that it would most affect those who had the least support at home and the fewest resources (Van-Lancker and Parolin 2020). The students in this situation would need the most teacher support. Little was known about how prepared school leaders and teachers had been before the pandemic to teach remotely, the extent and nature of the support they received during the school closures, or how prepared the schools were when they reopened.¹ We argue in this paper that research evidence on preexisting and ongoing inequalities in access to material and nonmaterial education resources, including technology, training, and guidance, as well as infrastructural conditions, can shed light on how prepared school leaders and teachers in Rwanda were to continue schooling during the COVID-19 emergency. We were able to explore these issues by building on the research we had conducted in Rwanda's secondary schools before the pandemic. The following three research questions (RQs) guided our exploration:

RQ1: To what extent were school leaders and teachers prepared for remote teaching?

RQ2: What aspects of school leaders' preparedness enabled them to support teachers, and teachers to support students, during the school closures?

¹ In this paper, school leaders include head teachers, deputy head teachers, deans of studies, and deans of teachers, which are recognized leadership categories in the Rwandan education system (Cheriyian, Leonard, Menon et al. 2021).

RQ3: How prepared were schools to reopen, and what challenges did school leaders and teachers find necessary to address when they returned to the schools?

We have framed this paper within the broader theory of knowledge mobilization (Cooper, Levin, and Campbell 2009; Levin 2011), which is the search to understand the connections between research, policy, and practice while seeing knowledge as a context-situated social process. Previous research following knowledge mobilization posits that “using research evidence should lead to more informed policy, higher-quality decisions, more effective practices, and, in turn, improved outcomes” (Cooper et al. 2009, 160).

We engaged with Rwandan teachers and school leaders in an effort to understand what preexisting conditions and available support enabled them to continue schooling during the pandemic, and what their main concerns were when the schools reopened. While their views cannot provide a complete picture, what these teachers and school leaders experienced during this challenging time provides invaluable data, given their direct contact with students, parents, and other education actors. Based on these key education actors’ perspectives, we aim to inform policy and practice by identifying areas where support, including material and nonmaterial aspects that contribute to continuing education, may be needed, and to uncover inequalities that may require action to tackle the present and future emergencies.

As INEE (2020a, 7) suggests, “crises often provide opportunities for positive change, and innovations developed for the pandemic response might prove useful in reaching marginalized communities in the future.” Burde et al. (2017) urge us to understand that responding to “emergencies” goes beyond meeting immediate needs and must also include providing ongoing support once the initial emergency appears to have passed. In that regard, we see this research as contributing critical knowledge to decisionmakers and other stakeholders that will help them plan for and cope with future emergencies (Cooper et al. 2009; Levin 2011).

Given the government initiatives to provide ongoing education during the school closures, Rwanda provides an interesting opportunity to explore how prepared school leaders and teachers were to support students during the COVID-19 emergency. When the schools closed, the Rwanda Education Board (REB) began broadcasting educational programs on national television and radio, and it launched a YouTube channel called REB eLearning that provided educational

content.² The REB also strengthened its online portal to support remote learning by providing teachers and school leaders with professional development in digital skills.³ We examined how school leaders' and science, technology, engineering, and math (STEM) teachers' prior experience with technology and their online experiences enabled them to engage with remote learning, as well as what support they received when the schools reopened.⁴ Our findings offer important lessons for future emergencies that require a shift to distance teaching and learning.

In the next section, we present a framing of this research relative to the existing literature and provide an overview of the study context. We follow with our research design, the study findings, and a discussion and conclusion, which include policy implications.

PREPAREDNESS IN THE CONTEXT OF COVID-19

Previous health emergencies, such as the Ebola and influenza outbreaks, offer important lessons on how to prepare education systems to provide remote education. However, such evidence is limited, particularly for emergencies on the scale of the COVID-19 pandemic (Hallgarten 2020; Hartenberger-Toby 2020; Srivastava et al. 2020). In this paper, we argue that research evidence on preexisting and ongoing material and nonmaterial inequalities, including access to technology, training, guidance, and infrastructure conditions, can shed light on how well-prepared school leaders and teachers in Rwanda were to continue schooling during the COVID-19 emergency. This important knowledge will help to inform policymakers and practitioners who seek to improve the preparedness and build the resilience educators need to provide ongoing education during future emergencies, and to do so in a manner that ensures education equality, fairness, and justice.

2 REB is one of six agencies within Rwanda's ministry of education. It has national oversight for delivering education at the preprimary, primary, and secondary levels, and oversees matters such as curriculum development, the development and management of teachers, and assessment, and the promotion of the use of information and communication technology in education; see <https://www.youtube.com/channel/UCCSm2s9wZC8B611S1slsUWg>.

3 See <https://elearning.reb.rw/>.

4 We gathered the perspectives of the Rwandan school leaders and the secondary STEM teachers we were engaged with before the pandemic as part of the Mastercard-funded Leaders in Teaching Initiative. We focused on these teachers because, prior to the school closures, the Government of Rwanda and donor organizations had emphasized the importance of STEM at all levels of education for the country's development (Ministry of Finance and Economic Planning 2000).

To gain an understanding of how these issues have presented in settings comparable to Rwanda, we reviewed the level of technological preparedness of schools in low- and lower-middle-income contexts to provide remote schooling, along with the related issue of teacher training. We also explored the emerging literature on the different types of support schools have received from multiple sources to help them cope with remote learning during school closures due to emergencies, including the coronavirus pandemic in low- and lower-middle-income contexts.

TECHNOLOGICAL PREPAREDNESS

Research conducted in low- and lower-middle-income contexts documents the lack of technology available for remote learning, particularly among students from less advantaged backgrounds and those living in rural areas (Tadesse and Muluye 2020; Vegas 2020; Nthenya et al. 2021). A large-scale review conducted in Africa (OECD 2018) identified critical gaps in access to technological devices and the internet. A UNICEF survey conducted during the COVID-19 emergency (Dreesen et al. 2020) estimated that approximately 75 percent of the sub-Saharan African population has no internet access. Researchers have also found vast inequality in the percentage of households that have a television, which is as low as 1 percent in rural Chad and as high as 76 percent in urban Guinea and Mauritania (Dreesen et al. 2020). The same report indicates that government responses to this lack of resources has included the distribution of radios in Somaliland and Burkina Faso and, in Burundi, preloaded lessons on memory cards that students can play on mobile phones. This report also indicates that, across the African continent, women are 70 percent less likely than men to own a smartphone and 34 percent less likely to have access to mobile internet. These differences in access to technology that favor men are also found in education settings, as is highlighted in a report on the need to strengthen STEM and information and communications technology education in sub-Saharan Africa (Gardner et al. 2018). This report also found that female teachers in Zambia, Mozambique, Uganda, Ghana, Tanzania, and Kenya are typically less well equipped with technology for teaching than male teachers. The authors argue that a targeted provision of technology resources to female teachers could enhance girls' learning opportunities and help narrow the gender learning gap in the region.

Although computers are increasingly important to the teaching profession for planning lessons and for preparing and downloading teaching materials (Van-Deursen and Van-Dijk 2019), recent studies have found that access to computers is less prevalent in low- and lower-middle-income contexts, particularly sub-Saharan Africa (Dube 2020; Adarkwah 2021b; Hallgarten, Gorgen, and Sims 2020). Research in Zimbabwe, for

example, suggests that only one in two teachers had access to a computer during the COVID-19 pandemic (Maphosa 2021). Others found that access to computers and the internet was provided primarily to schools rather than to individual teachers (Mutula 2003; Agyei 2021), which often made it difficult for teachers to access computers during the school closures (Maphosa 2021). In light of these findings, it is critical to gain an understanding of the preexisting and ongoing inequalities in access to resources for remote teaching in Rwanda, particularly to education technologies, given that this was one of the approaches to providing remote education in that country during the COVID-19 emergency.

PREPAREDNESS FOR REMOTE TEACHING

Having access to technology is not the only requisite for successful remote learning; teachers and students also must be able to use these technologies for educational purposes. Previous research on the use of technology in schools has emphasized the need to train teachers appropriately so they can use technology to promote successful student learning (Hennessy, Haßler, and Hofmann 2015; Selwyn 2020; Rubagiza, Were, and Sutherland 2011). In Rwanda, for example, Rubagiza et al. (2011) noted that the technology introduced in classrooms in the early 2000s lacked both appropriate teacher professional development and adequate support to enable students to get the most out of new innovations. Furthermore, evidence from the region posits that teachers' age is a barrier to their integrating online technologies into their teaching (Tedla 2012), as older teachers have generally been more resistant to using technology.

During the COVID-19 emergency, countries in sub-Saharan Africa used different methods of remote learning. Drawing from administrative and survey data collated by the Centre for Global Development at the onset of the pandemic, Vegas (2020) found that sub-Saharan African governments aimed to maintain communication with teachers during the school closures, and around one-third encouraged or required teachers to communicate with their students. For example, the Angolan government supported the continuation of schooling by maintaining communication with teachers through its educational television channel. In Nigeria, communication between education authorities with students and teachers was maintained primarily via radio and online content on dedicated websites. Education authorities expected teachers in Uganda and Zambia to develop "learning packages" that students could use to learn at home. However, Vegas (2020) found that, despite these efforts, teachers often lacked training in remote teaching. The inadequate training, particularly in distance learning, appeared

to be more acute in places where access to electricity and technology devices are uncommon (Adarkwah 2021a).

In May 2020, in recognition of this gap, the International Task Force on Teachers for Education 2030 identified training in online teaching as critical to continuing schooling during the COVID-19-related school closures (UNESCO 2020). Researchers also recognized the importance of providing flexible training sessions in order to accommodate the time teachers must dedicate to their household duties and caregiving, which has been particularly crucial for female teachers (Collie 2021; Klapproth et al. 2020; Lockee 2021; Adarkwah 2021b). During the school closures, however, decisionmakers often found it challenging to collect the data needed to help them choose the best approaches to teacher professional development (Jordan et al. 2021). We argue, therefore, that to target resources and training where they are most needed, it is essential to understand how prepared teachers are, should the need arise, to continue schooling remotely.

SUPPORT FOR SCHOOL LEADERS AND TEACHERS DURING THE SCHOOL CLOSURES

School leaders and teachers are likely to require support to continue schooling during school closures. For the purposes of this paper, we focus in particular on the guidance and knowledge schools in Rwanda received in order to continue schooling remotely during the COVID-19-related school closures, which came from a range of sources, including the government, charitable organizations, parents and communities, and peer teachers (Mitchell et al. 2022; Reimers and Schleicher 2020; Srivastava et al. 2020). At the start of the pandemic, school leaders and teachers also received guidance on how to prevent both the spread of the coronavirus—which typically consisted of reputable, science-based information about the virus—and the dissemination of fake news about COVID-19 (Bender 2020).

As a recent report from Rwanda (Al-Fadala et al. 2021) highlights, school leaders can play a crucial role in maintaining student engagement during school closures. The report stated that school leaders had been instrumental in coordinating with parents and communities to support remote learning during the school closures. In Ethiopia, school leaders working in urban areas and those who had access to a phone were more likely than others to receive government guidance on keeping education going during the school closures (Yorke et al. 2020). Teachers were more likely to receive the support they needed if their school leaders had received support and guidance regarding how to keep schooling going. Supporting school

leaders and teachers to keep schooling going during the pandemic remained important even after most schools had reopened.

In this paper, we argue that preparing to keep education going during an emergency involves more than knowing what material resources schools should have on hand; it also requires providing proper teacher training in distance learning and the use of technologies, plans for reaching students who lack access to online learning, support for their learning at home, and plans for reopening schools (Srivastava et al. 2020). Understanding how prepared school leaders and teachers were to provide remote education in Rwanda during the COVID-19 crisis, and their concern about what steps they should take when they returned to the classroom, provides insights into where education providers fell short and can help decisionmakers be better prepared to keep education going in future crises (Cohen et al. 2021; Rigall 2020; Vu and Savonitto 2020).

THE RWANDAN CONTEXT

To put into context how prepared Rwandan school leaders and teachers were to provide remote learning during the COVID-19 crises, and later to reopen the schools, we offer this brief overview of the state of secondary education before the schools closed. Enrollment in Rwanda's secondary schools is low: only 43 percent of males and 49 percent of females ages 12-13 were enrolled in secondary education in 2018 (EPDC 2018). In addition, girls are more likely to be out of school after age 16—the equivalent of the third grade of secondary school (high school junior in US schools), especially in rural districts (Laterite 2017; Menon, Leonard, and Nzaramba 2021). There also are gender gaps in the Rwandan teacher workforce; in 2017, for example, there was one female secondary school leader for every four male leaders (Cheriyana et al. 2021).

Prior to the pandemic, teachers' and students' competence in using technology was supported by equipping schools and teachers with suitable devices and training (Mushimiyimana 2021; Mugiraneza 2021; REB/MINEDUC 2015; Mastercard Foundation 2020; Ministry of Education 2016). Most secondary schools in the country were on the electric grid or had solar power before the school closures, but only 53 percent had internet access (INEE 2021). In 2011, the ministry of education introduced model "schools of excellence," which were better resourced than regular schools, including having laboratories, information and communications technology equipment, and libraries (Ministry of Education 2018).

Despite the Rwandan government's efforts to provide schools and teachers with adequate equipment and training, access to technology in Rwanda's schools (and households) remained limited, which presented a challenge when the need arose to provide remote education during the COVID-19 pandemic. Although radio access is nearly universal in Rwanda, a recent report showed that fewer than 50 percent of students used the radio to continue their education (INEE 2021). Moreover, only about 67 percent of households own a mobile phone and 8 percent have a television, and access to technology varies substantially between urban and rural areas. Home internet access is less than 30 percent across Rwanda and just 2 percent in rural areas, while computers are available in only around 3 percent of households (Kimenyi, Chuang, and Taddese 2020).

When the government of Rwanda encouraged the continuation of schooling during the school closures by providing lessons via television, radio, and online channels, we decided to explore how well prepared school leaders and teachers were to teach remotely. We also sought to understand whether school leaders and teachers had the support they needed to help their secondary students continue with their education and to ensure their return when the schools reopened.

RESEARCH DESIGN

In August 2020, we conducted phone surveys with individuals we had initially interviewed face-to-face in February and March 2020, before the schools closed. Given the restrictions on face-to-face interaction due to COVID-19, we considered that phone surveys were now the most appropriate data-collection method. We drew from previous research experience using phone surveys in low-income contexts where it was not feasible to collect data in person (Firchow and Mac Ginty 2020; Hoogeveen et al. 2014; Dabalen et al. 2016). We wanted to gain an understanding of these school leaders' and STEM teachers' level of preparedness to support students during the COVID-19-related school closures, and when the schools reopened. The participants were from 14 school districts in Rwanda where the Leaders in Teaching initiative is active (Figure 1). The data we collected previously provided evidence on teaching quality and student learning outcomes (Carter et al. 2021; Cheriyan et al. 2021).

Figure 1: Rwanda's 14 Districts Where Data Have Been Collected



We developed two precoded questionnaires, one for school leaders and one for teachers, which went through various stages of development and refinement.⁵ We finalized them after consulting with key stakeholders, including our partners who were implementing teacher professional development interventions as part of the Leaders in Teaching initiative. The Leaders in Teaching initiative is funded by Mastercard and counts on implementing partners based in Rwanda and learning partners based at the Research for Equitable and Accessible Learning Centre at the University of Cambridge.⁶ The questionnaires were all translated into the local language, Kinyarwanda, and the team members ensured that the questions accurately conveyed the intended meaning, that the terms and concepts were relevant in the Rwandan context, and that the language was simple and clear. Throughout the training and pilot activities, the team continued to refine the questionnaire translations by collecting feedback from the study participants and enumerators; in Rwanda, enumerators conducted the surveys with school leaders and teachers over the phone.

5 The questionnaires are available at <https://www.educ.cam.ac.uk/centres/real/researchthemes/teachingandlearning/leaders/>.

6 See <https://www.educ.cam.ac.uk/centres/real/researchprojects/ongoing/leaders-in-teaching-rwanda/>.

We used the surveys to collect information about the research participants' technological preparedness before the schools closed, such as their access to devices and their experience with remote teaching. We also collected information on the type of support teachers and school leaders had both received from the education authority and other local providers and given to their students during the school closures, on the challenges they anticipated upon the return to school, and on how prepared the schools were to reopen.

We obtained a research permit from Rwanda's National Commission for Science and Technology to proceed with data-collection activities. We also received approval from the University of Cambridge ethics panel to conduct our research. These ethical processes required us to obtain the participants' full consent and to assure them of their rights, including to withdraw from the study at any point if they so desired. We guaranteed the participants' confidentiality and anonymity by removing identifiable information from the written records and providing safe data storage in dedicated facilities.

During the global health emergency, many research projects used phone surveys to contact potential participants (UNESCO 2021; Ford, Porter, and Pankhurst 2021; Ford and Singh 2021; Yorke et al. 2021). Nevertheless, there are recognized downsides to the method. First, there is a risk of skewed results, as the respondents might overrepresent individuals who live in areas with phone networks and electricity and those who have access to a device. However, as we have noted, our sample included teachers and school leaders with whom we had contact prior to the pandemic, and we had an extremely high response rate. Second, it can be challenging to conduct research over the phone if the reception is not good, and it can be difficult to maintain a rapport with participants. Therefore, the length of calls must be carefully considered; we designed the surveys to ensure that calls were the recommended optimal length, just 25 minutes on average (Yorke et al. 2020; Gourlay et al. 2021).

Given our desire to reach a large number of individuals in order to compare respondents' experiences across their different characteristics, and being mindful of the length of the calls, we chose to adopt precoded questions. While we recognize that this limited the possibility of exploring participants' experiences in depth, it was more relevant to our purposes (see Yorke et al. 2021).

We aimed to interview all the school leaders included in a previous round of research; this included 309 school leaders and one teacher from each of the 309 schools. We already had records of respondents' characteristics, such as age, gender, years of experience, disability status, and highest education level, and we were able to link these data with their responses to the phone surveys.

Of the planned 309 interviews, we were able to conduct 298 with school leaders and 297 with teachers from the same schools (Table 1). This extremely high response rate is likely due to the research team having recently conducted surveys in the schools, so the connections already had been made. During the first round of in-person data collection, respondents provided their phone numbers and were informed that they would be contacted again for a short survey. The reasons for the small number of nonresponses included failed attempts to locate participants, participants declining the request, or their being unavailable due to travel and health issues. The results in this paper clearly cannot be considered representative of all STEM teachers and school leaders in Rwanda, but they do provide the perspectives of nearly 600 individuals from the 14 school districts where the Leaders in Teaching initiative operates.

Table 1: Distribution of Teacher Characteristics in the Sample and Sampling Frame

Characteristics		Sampling Frame (population, N=1564)	Sampling Targets	Actual Respondents N=297
Gender	Female	27%	50%	113 (38%)
	Male	73%	50%	184 (62%)
Disability	Yes	3%	10%	30 (10%)
	No	97%	90%	267 (90%)
Experience	0-8 years	49%	33%	117 (39%)
	9-15 years	40%	33%	116 (39%)
	+15 years	11%	33%	64 (22%)

Table 2 shows the distribution of school types the people in our sample worked at, which included schools of excellence and regular schools. As noted, the main feature distinguishing the schools of excellence from other schools is a well-equipped computer and science laboratory and a library. Given that schools of excellence are expected to be better equipped with technology and devices, such as computers, we anticipated that the teachers and school leaders from these schools would have been better prepared to use that technology to support students during remote learning and to engage in remote teaching and school leadership training. Therefore, we disaggregated our findings according to the type of school where

possible (Ministry of Education 2018; Khan, Leonard, and Sabates 2020). Note that the large proportion of rural schools in our sample (92%) is due to the fact that these schools are the focus of the Leaders in Teaching initiative.

Table 2: Distribution of Types of Schools in the Sample

School Characteristics		Proportion	Total
School type	School of excellence	13%	40
	Regular school	87%	258
Location	Rural	92%	274
	Urban	8%	24

ANALYSIS

Before conducting our analysis, we entered and cleaned the collected data using STATA. We began by calculating the descriptive statistics of key variables to respond to the three research questions. We then conducted simple t-tests and chi-squared tests to compare means and to examine categorical variables of interest, respectively. For example, we explored the preparedness of teachers and school leaders by gender, and between schools of excellence and regular schools.

We next used logistic regression to respond to RQ 2. With our first model (model A) we sought to understand what aspects of preparedness enabled school leaders to support teachers during the school closures; we controlled for the school leaders' demographic characteristics and the type of school:

$$Sch_lead_sup_i = \text{Log} \left(\frac{\pi}{1-\pi} \right) = \alpha + \beta_1 Online_exp_i + \beta_2 Electricity_i + \beta_3 Comp_tab_i + \beta_4 Internet_i + \beta_5 Radio_i + \beta_6 TV_i + \beta_7 Smart_phone_i + \beta_8 Feature_phone_i + \beta_9 Received_guide_i + \beta_{10} CPD_i + \beta_{11} Sch_loc_i + \beta_{12} Sch_exc_i + \beta_{13} Gender_i + \beta_{14} Age_i + \beta_{15} Disability_i + \varepsilon_i. \text{ (Model A)}$$

In model A, the dependent variable $Sch_lead_sup_i$ is a dummy variable for whether a school leader supported their teachers during the school closures. Independent variables include those related to their preparedness: $\beta_1 Online_exp_i$ indicates whether or not the school leader had previous online experience; $\beta_2 Electricity_exp_i$ indicates that they access to electricity at home; and $\beta_3 Comp_tab_i$ notes that they had access to a computer or tablet. Access to the internet is denoted by $\beta_4 Internet_i$, and access to electronic devices that could be used for remote teaching is indicated as $\beta_5 Radio_i$,

β_6TV_i , $\beta_7Smart_Phone_i$, and $\beta_8Feature_Phone_i$. Other components of preparedness included having received guidance to continue schooling, $\beta_9Received_guide_i$, and participation in continuing professional development (CPD) during the school closures that could have supported their engagement with remote teaching: $\beta_{10}CPD_i$. Other background variables included whether the school was located in a rural or urban area, $\beta_{11}Sch_locat_i$; and school status—that is, regular school or school of excellence—was indicated by a dummy variable, $\beta_{12}Sch_exc_i$. $\beta_{13}Gender_i$, takes account of the school leader's sex; $\beta_{14}Age_i$, school leader's age group; and $\beta_{15}Disability_i$, is a dummy variable for disability status.

For the second part of RQ2, we used a dummy variable ($Teach_sup_i$) to explore whether or not teachers supported students during the school closures. For the independent variables, we included those mentioned for model A, adding $\beta_{16}Qualification_i$, to indicate whether or not a teacher had a bachelor's degree:

$$Teach_sup_i = \text{Log} \left(\frac{\pi}{1-\pi} \right) = \alpha + \beta_1 Online_exp_i + \beta_2 Electricity_i + \beta_3 Comp_tab_i + \beta_4 Internet_i + \beta_5 Radio_i + \beta_6 TV_i + \beta_7 Smart_phone_i + \beta_8 Feature_phone_i + \beta_9 Received_guide_i + \beta_{10} CPD_i + \beta_{11} Sch_loc_i + \beta_{12} Sch_exc_i + \beta_{13} Gender_i + \beta_{14} Age_i + \beta_{15} Disability_i + \beta_{16} Qualification_i + \varepsilon_i. \text{ (Model B)}$$

FINDINGS

We argue in this paper that research evidence from Rwanda on preexisting and ongoing material and nonmaterial inequalities, including access to technology, training, guidance, and infrastructure conditions, can shed light on school leaders' and teachers' level of preparedness to continue schooling during the COVID-19 emergency. The results show that prior online experience was uncommon among the participants; however, the better resourced schools and male teachers had, in general, more online experience than regular schools and female teachers. Access to computers or tablets was more prominent at schools of excellence and among school leaders and male teachers. We found that prior online experience, access to a radio, and having received guidance to continue schooling significantly predicted how well school leaders supported teachers during the school closures. Teachers in schools of excellence and those in the younger age groups were more likely to support their students during this period. When the schools reopened, school leaders and teachers were concerned that underprivileged students, who

tended to be overage, and weak learners would drop out. Teenage pregnancy was another serious preoccupation, and our participants suggested several ways the government could help to avoid these potential problems.

SCHOOL LEADERS' AND TEACHERS' PREPANDEMIC ONLINE EXPERIENCE AND ACCESS TO TECHNOLOGY

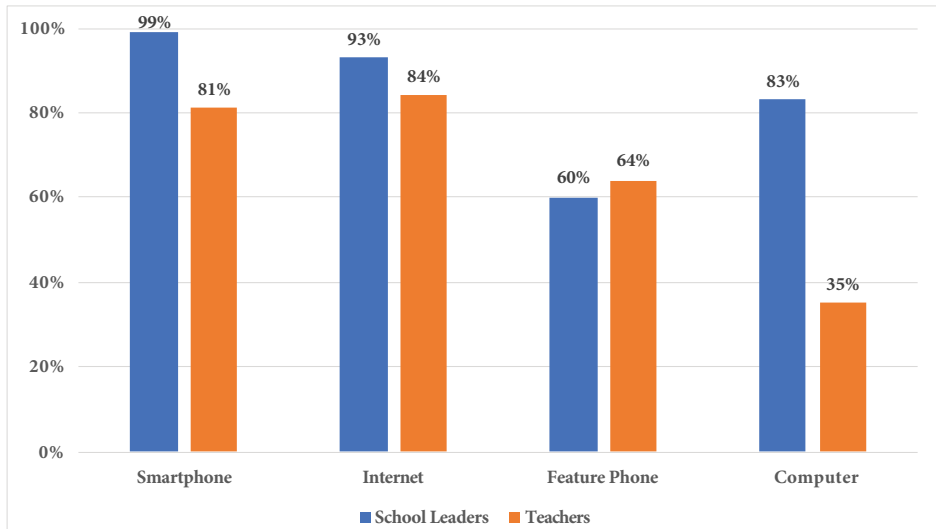
In this section, which focuses on RQ1, we provide descriptive statistics of our participants' online experience prior to the pandemic and the remote teaching technology they had access to.

We found that many of our participants did not have online experience prior to the pandemic, particularly teachers: only 17 percent of the teachers had this experience, as compared to 41 percent of the school leaders. Moreover, the teachers' online experience was not directly related to teaching but to professional development, such as taking online classes and receiving training on e-learning. More than two-thirds of the school leaders and teachers with prior online experience believed it had helped them adapt to remote learning during the school closures.

While there was no gender gap in the school leaders' online experience, the male teachers were significantly more likely to have prior online experience than the female teachers, 22 percent versus 9 percent ($\chi^2(1)=8.30$, $p=.004$). We did not observe any statistically significant difference in previous online experience based on the type of school, or among school leaders or teachers with a disability.

The extent of their access to technology before the school closures likely affected the school leaders' and teachers' ability to support students via remote teaching. Our findings show that most school leaders and teachers in our sample had access to smartphones, feature phones, and the internet, but only 35 percent of the teachers had access to computers or tablets (Figure 2), as compared to 83 percent of the school leaders.

Figure 2: School Leaders' and Teachers' Access to Information and Communications Technology Equipment



We did not find statistically significant differences in access to smartphones, the internet, or feature phones by teachers' or school leaders' gender or disability status. However, we did identify a significant and sizeable gender disparity in access to a computer or tablet: 40 percent of male teachers reported having access to these devices, compared to 27 percent of females ($\chi^2(1) = 5.00, p = .025$). Given that these devices were the expected means of providing remote teaching and learning, these gender differences raise important questions about whether female teachers, and teachers in general, had access to the technology they needed to support online teaching.

We also observed statistically significant differences in access to smartphones, the internet, and computers between teachers from schools of excellence and other schools (see Table 3). Teachers in the schools of excellence were better equipped than those in the regular schools. The differences were sizeable with respect to computer or tablet ownership; teachers in schools of excellence were twice as likely to own a device as those in regular schools. This is not surprising, given that schools of excellence were established to serve as models, including having such technology. However, this lack of access to technology could have created a divide in the level of support the better resourced schools could provide and that provided by the regular schools. Other research revealed that students from advantaged backgrounds are more likely than the underprivileged to attend

schools of excellence (Cheriyān et al. 2021), which could have widened the divide during the school closures.

Table 3: Access to Resources among Teachers from Schools of Excellence and Teachers from Regular Schools

Resources	Schools of Excellence	Regular Schools	Statistical Significance
Smartphones	95%	77%	***
Internet	98%	81%	***
Computer or tablet	65%	31%	***

*** indicates statistical significance at the 1 percent critical level

SUPPORT PROVIDED BY SCHOOL LEADERS AND TEACHERS DURING THE SCHOOL CLOSURES

To address RQ2, we report on the school leaders' preparedness to support teachers during the school closures, and on teachers' ability to support their students. We first identify the proportion of school leaders and teachers who provided support during the school closures, and then address any differences in the level of support according to gender, disability, school location, and type of school. To predict who provided support, we ran logistic regressions using several independent variables of preparedness, including prior online experience and access to devices.

Given that additional training might have enhanced remote teaching during the COVID-19-related school closures, we also explored what support and training were available to teachers when the schools were closed, such as guidance in how to continue schooling and CPD. We also controlled for characteristics of the schools and school leaders, and of the teachers. Building on this, we examined the relationship between the support school leaders gave teachers and the support teachers gave students, considering the various material and nonmaterial aspects of preparedness for remote education. Table 4 presents descriptive statistics of the dependent and independent variables in the two logistic regression models we used in preparing this paper.

Table 4: Descriptive Statistics of the Dependent and Independent Variables in the Logistic Regression Models

Variable	School Leaders	STEM Teachers
School leaders supported teachers	69%	-
STEM teachers supported students	-	42%
<i>Skills and technological preparedness</i>		
Online experience	41%	17%
Electricity	96%	86%
Computer or tablet	83%	35%
Internet	92%	82%
Radio	92%	91%
Television	81%	42%
Smartphone	99%	78%
Feature phone	59%	63%
<i>Available support and additional training</i>		
Received guidance to continue schooling	42%	33%
Engaged in CPD during the school closures	48%	31%
<i>School characteristics</i>		
School location (urban)	8%	8%
School of excellence (yes)	13%	13%
<i>Demographic characteristics</i>		
Gender (female)	19%	38%
Age 26-38	30%	30%
Age 39-44	32%	32%
Age 46-65	37%	36%
Disability (yes)	7%	10%
Bachelor's degree (yes)	-	38%

Of our participating school leaders, 69 percent reported providing support to teachers during the school closures, such as by sharing websites and other resources and encouraging them to participate in CPD. No statistically significant differences were found in the level of support provided relative to the school leaders' gender, disability, school location, or type of school. Of our participating teachers, 42 percent reported providing support to their students during the school closures. Again, we did not identify differences in the level of support provided relative to the teachers' gender, disability, or school location. However, 62 percent of the teachers in schools of excellence supported their students during the school closures, compared to 39 percent of the teachers in regular schools ($\chi^2(1)=8.06, p=.005$).

Table 5 presents the results of the logistic regressions of school leaders' support to teachers. The results show that having online experience prior to the pandemic and access to a radio were positively associated with a higher likelihood of school leaders providing support to teachers, significant at the 10 percent level. Having other technological devices, such as computers, tablets, and televisions, were not significantly associated with leaders' support of teachers. These results further indicate that school leaders who received guidance on how to continue schooling were five times more likely to support their teachers during the school closures, controlling for school and demographic characteristics.

Table 5: Logistic Regression Regarding Provision of Support from School Leaders to Teachers and Different Aspects of Preparedness

Dependent Variable: School Leader Support to Teachers (no/yes)	Odds Ratio
<i>Skills and technological preparedness</i>	
Online experience	1.78*
Electricity	.519
Computer or tablet	1.69
Internet	.772
Radio	2.54*
Television	1.30
Smartphone	.699
Feature phone	.891
<i>Available support and additional training</i>	
Received guidance to continue schooling	5.13***
Engaged in continuing professional development	1.54
<i>School characteristics</i>	
School location (urban)	.491
School of excellence (yes)	1.03
<i>School leader characteristics</i>	
Gender (female)	.908
Age 39-44	1.01
Age 46-65	.676
Disability (yes)	.783
Constant	.882 (1.65)
Observations	297
Pseudo R2	.1646

* p<0.10, ** p<0.05, *** p<0.01; robust standard errors in parentheses

Note: Age group reference category: 26-38

As for teachers' support of students, Table 6 shows that neither prior online experience nor access to technology significantly predicted a higher likelihood that teachers supported their students. Having received guidance on how to continue schooling and participating in CPD during the school closures were not significantly associated with teachers' support of students.

We found that teachers in schools of excellence were twice as likely as those in regular schools to support their students. The teachers in schools of excellence might have been better prepared and thus have had a higher degree of competence in using technological devices to teach and support students remotely, an advantage likely shared by their students. Our findings also revealed that younger teachers were more likely to support their students than their older counterparts.

Table 6: Logistic Regression Regarding STEM Teachers' Support of Students and Different Aspects of Preparedness

Dependent Variable: STEM Teacher Support to Students (no/yes)	Odds Ratio
<i>Skills and technological preparedness</i>	
Online experience	1.72
Electricity	.687
Computer or tablet	1.29
Internet	.740
Radio	1.80
Television	.768
Smartphone	1.35
Feature phone	.711
<i>Available support and additional training</i>	
Received guidance to continue schooling	1.52
Engaged in continuing professional development	.796
<i>School characteristics</i>	
School location (urban)	.783
School of excellence (yes)	2.21**
<i>Teacher characteristics</i>	
Gender (female)	1.01
Age 39-44	.507**
Age 46-65	.489**
Disability (yes)	1.28
Bachelor's degree (yes)	1.25
Constant	.810 (.573)
Observations	296
Pseudo R2	.0738

* p<0.10, ** p<0.05, *** p<0.01; robust standard errors in parentheses

Note: Age group reference category: 26-38

PREPAREDNESS FOR REOPENING SCHOOLS

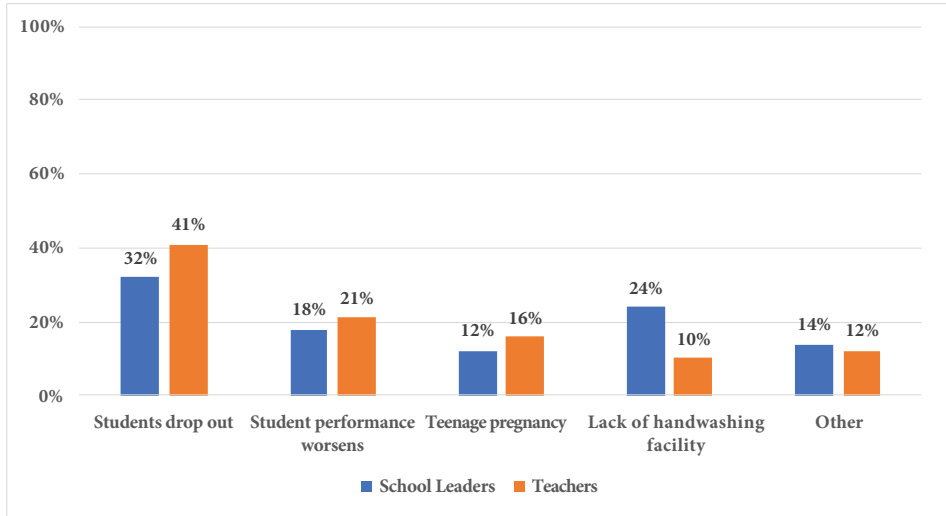
In this subsection, which addresses RQ3, we examine the schools' level of preparedness to reopen, including the opportunities and challenges they expected to encounter. Overall, 45 percent of school leaders believed their schools had the handwashing facilities (soap and clean water) needed to prevent the spread of COVID-19; 70 percent of those in schools of excellence indicated that they were so equipped, compared to 42 percent in the regular schools ($t=3.43$, $p<.001$). The REB's school reopening plan for Rwanda included constructing washing facilities in the public schools.

School leaders and teachers believed the best way to implement social distancing when schools reopened was to build additional classrooms. Acting on this recommendation, and in an effort to tackle possible overcrowding and the long distance some students had to travel to school, the ministry of education announced in June 2020 that it would construct 22,505 additional classrooms in Rwanda's 30 districts by September of that year (Ministry of Education 2020a; World Bank 2020). School leaders and teachers also suggested that classrooms be rearranged to keep students at a distance, such as putting chairs one meter apart and increasing the number available; offering half-day school shifts was another suggestion.

One-quarter of the school leaders reported having received training or official guidance in identifying early signs of COVID-19, the greater proportion of them in schools of excellence than in regular schools (33% versus 24%; $\chi^2(1) = 1.42$, $p = .233$). Rwanda's school reopening plan included the ministry of education and aid donors developing and implementing COVID-19 training for school staff members and students; this included taking measures to promote good hygiene, such as hanging posters to promote handwashing and spread awareness of COVID-19 symptoms.

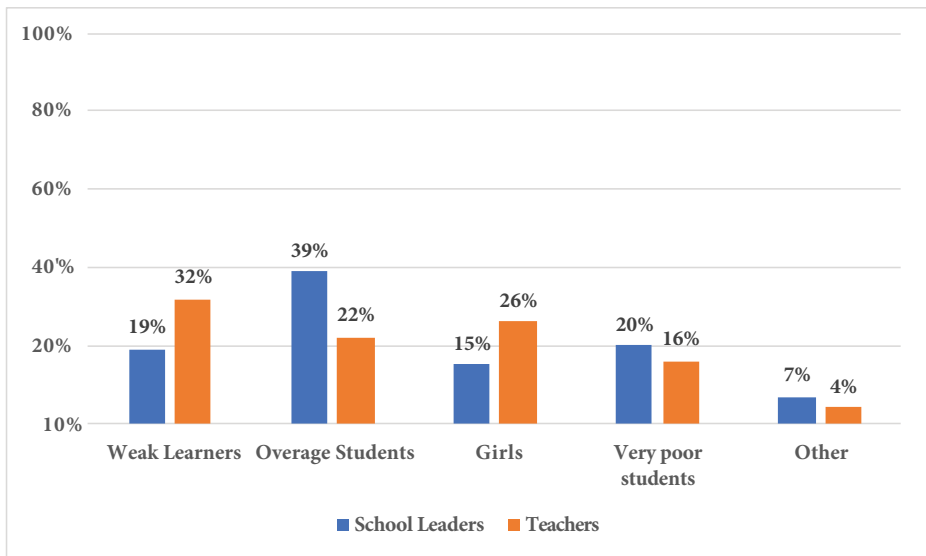
In total, 61 percent of school leaders reported having received government directives on implementing disease-prevention measures once schools reopened, and most also indicated that they would rely on these directives once schools reopened. Despite the health issues the ongoing pandemic would likely create when schools reopened, 92 percent reported that they had no nurse or health officer, and we could not find any information on the inclusion of health personnel to the schools.

Figure 3: Expected Challenges Declared by School Leaders and Teachers



The most common challenges school leaders and teachers said they anticipated included students dropping out, worsening student performance, and teenage pregnancy (Figure 3). In fact, 45 percent of the school leaders and 63 percent of the teachers believed that some students were not likely to return to school, in particular the overage students, weak learners, and girls (Figure 4).

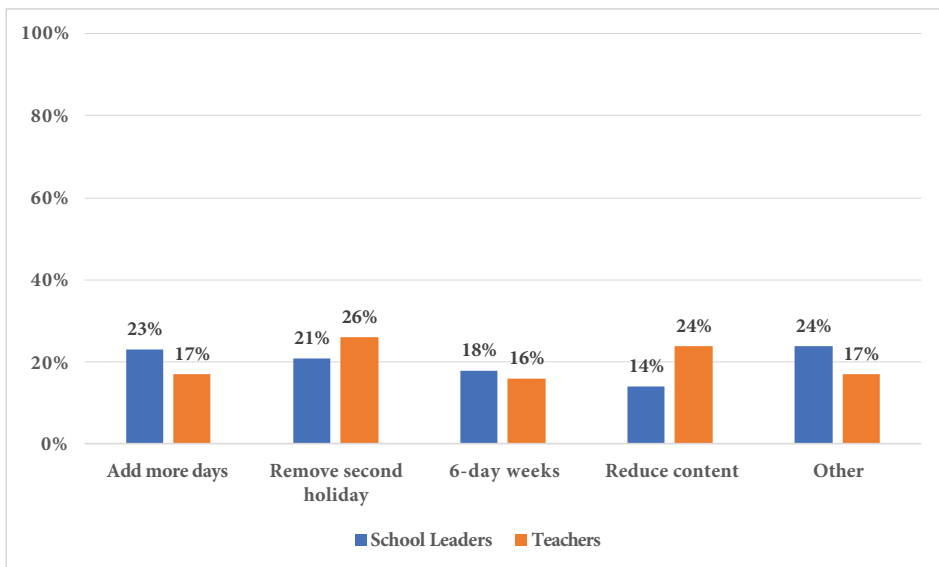
Figure 4: Groups of Students Most Likely to Drop Out, According to School Leaders and Teachers



School leaders and teachers alike believed that the school closures would affect two key areas: students' motivation to learn (44% and 39%, respectively) and student discipline (27% and 23%, respectively). The participants also believed that students' English proficiency and practical courses such as laboratory sessions would be affected negatively, although to a lesser extent. Moreover, approximately 58 percent of the school leaders and 59 percent of the teachers believed that students from low-income families benefitted the least from remote learning, which would likely affect their decision to continue their education once schools reopened. To address this problem, the REB reopening plan included procuring and distributing solar-powered radios and e-learning devices to lower-income families (Ministry of Education 2020b).

When we asked the research participants what actions schools could take to ensure that students would return to school, they suggested the sensitization of the local authorities, such as convincing parents to send their children back to school, allowing parents to stagger the payment of school fees, and having teachers follow up with students individually. Of the participants, 76 percent of school leaders and 68 percent of teachers felt that the sensitization of local authorities would be vital in bringing students back to school. They believed that the best strategy to catch up on missed school time would be to cancel or shorten the holidays and reduce the curriculum content (Figure 5).

Figure 5: Best Catch-Up Strategies According to School Leaders and Teachers



DISCUSSION AND CONCLUSION

Following the COVID-19-related school closures around the globe, many education systems opted to provide remote education. This required teachers and students to teach and learn remotely, a situation for which many of them were not prepared. In Rwanda, providing technology-mediated instruction was part of the government's approach to continuing education during the pandemic, which included providing guidance and training for teachers and school leaders on how to make this adjustment successfully. In this paper, we have drawn from knowledge mobilization theory, particularly with regard to how research evidence informed policy and practice in the context of school closures in Rwanda. We found a number of material (i.e., access to technology) and nonmaterial (i.e., training and guidance) resources that appear to be associated with school leaders' and teachers' level of preparedness to continue schooling and support education during the COVID-19 emergency.

The evidence suggests that school leaders had significantly more online experience than teachers, but that their experiences were mostly related to CPD rather than remote teaching. As pointed out in the literature, in cases where online teaching and learning are needed to continue schooling, they should be accompanied by relevant professional development that targets strengthening teaching (UNESCO 2020; Rubagiza et al. 2011; Selwyn 2020).

We also found that male teachers had more online experience than female teachers before the pandemic, which could be explained by the widely documented responsibility female teachers in sub-Saharan Africa have for both professional and household responsibilities (Collie 2021; Klapproth et al. 2020; Lockee 2021; Adarkwah 2021b). Thus, in line with prior research, our findings suggest that increasing online training for teachers would be beneficial, providing it is sufficiently flexible and culturally relevant to as many female teachers as possible (Lockee 2021; Jordan et al. 2021).

While most school leaders and teachers had access before the school closures to the kind of technology that can help to conduct remote schooling, including radios and cellphones, computers and tablets were less accessible. Access to devices was notably greater in the better resourced schools of excellence than in the regular schools, and male teachers had more access than female teachers. Our findings support previous studies in sub-Saharan Africa, which have found that differences in access to mobile phones, computers, and the internet favor males, including in education settings (OECD 2018; Gardner et al. 2018; Maphosa 2021). Limited access to technological resources, particularly computers, tablets, and the internet,

might be explained by the fact that these devices were provided to schools rather than to individual teachers during previous school reform efforts (Mutula 2003; Agyei 2021). Despite the prevalence of smartphones among Rwandan educators and in some secondary students' households (as also found by Dube 2020; GSMA 2015; Kimenyi et al. 2020; Adarkwah 2021b; Hallgarten et al. 2020), it is unlikely that smartphones alone can provide the support needed during school closures, as teachers need devices they can use to prepare lessons and design, download, and print materials (Van-Deursen and Van-Dijk 2019). Therefore, we argue that targeted access to computers or tablets would be beneficial, especially for female teachers and teachers from regular schools that are not well resourced.

Providing remote education that relies on technology requires that teachers be trained in using such resources for teaching and learning; however, our findings suggest that this type of CPD was limited during the school closures. We found further that fewer than half of the school leaders and less than one-third of the teachers in our sample received guidance on how to continue schooling during the school closures; a similar proportion engaged in CPD. These low numbers could indicate a lack of guidance and CPD on keeping education going, or that school leaders and teachers could not access it for other reasons, such as time constraints. Other studies indicate that female teachers had to cope with their professional responsibilities along with caregiving and family duties across different contexts, which might have prevented many of them from participating in CPD (Collie 2021; Klapproth et al. 2020). Thus, it would be beneficial for governments and other supporting organizations to provide CPD to those who could not participate during the school closures, with a particular focus on female teachers, who also are less likely than men to have had prior online experience.

Our exploration of school leaders' preparedness to support teachers indicates that they were more likely to do so during the school closures if they had prior online experience, had access to a radio, and had received guidance on continuing schooling. These findings resonate with recent literature on the vital role school leadership played in keeping schools engaged with their staff members and learning communities during the pandemic (Al-Fadala et al. 2021; Yorke et al. 2020). Notably, our study revealed a number of material and nonmaterial resources had helped prepare school leaders to support their teachers during the school closures. In this regard, the government of Rwanda and other stakeholders can play an important role during an emergency, for example, by providing the technological equipment and training that can enable school leaders to maintain communication with teachers, parents, and students.

When examining teachers' support of students during the school closures, we found that, while their skills and access to technology did not predict the level of support they provided, teachers from the better resourced schools of excellence were significantly more likely to support their students than those from the regular schools. This suggests that the regular schools need more direct attention to ensure that they have suitable facilities and, importantly, sufficient training to ensure that their teachers and students will be able to use devices for remote teaching and learning, should the need arise, as some have maintained in the broader literature (Hennessy et al. 2015; Selwyn 2020; Rubagiza et al. 2011). We also found that older teachers might require additional help to support students' learning using electronic and online means during the school closures. These results confirm previous research findings in Rwanda, which indicate that, since technologies such as computers were introduced in the secondary schools, the more experienced teachers who might also have administrative duties tended to use the electronic devices to fulfill these tasks instead of for teaching (Rubagiza et al. 2011). Evidence from the region posits that teachers' age is another barrier to their integrating online technologies into their teaching (Tedla 2012).

Only half of the school leaders in our study believed their schools were prepared to reopen after the COVID-19-related closures. They were concerned about the limited sanitation facilities, for example, and they thought they would need to build additional classrooms to allow the social distancing called for in the government plans (Ministry of Education 2020a; World Bank 2020). Moreover, few school leaders reported having received guidance on identifying early signs of COVID-19 and preventing the spread of the disease in the school community, which they considered vital to the schools' preparedness to reopen. Most schools also did not have nurses on site. While this is not uncommon in low- and lower-middle-income countries, the experience of COVID-19 raised the need to address this issue for future health emergencies (Al-Fadala et al. 2021; Vu and Savonitto 2020; Cohen et al. 2021; Rigall 2020). Apart from keeping the school community safe, having nurses on site might reduce the burden on teachers (Rose et al. 2021).

Both school leaders and teachers in Rwanda identified the overage students from poorer backgrounds and girls as being most at risk of dropping out; UNICEF and its global partners anticipated these threats at the onset of the pandemic (Bender 2020; UNICEF 2020; Miks and McIlwaine 2020). Our research further emphasizes that measures to contain COVID-19 while keeping vulnerable students in school are now needed more than ever. Given the uncertainty of whether and when remote teaching and learning are to happen again, governments and other decisionmakers could take action now so that overage poor students and girls are prioritized in

terms of giving them the technological resources and skills they need to keep engaged with their education, even from a distance.

Finally, our research highlights the need to provide female teachers with equal access to technology and training, and to pay particular attention to the school leaders and teachers working in the regular schools, which have more limited resources. Our research participants stressed a need for health and safety measures that not only prevent the further spread of the disease but help reduce the risks of dropouts, particularly among less well-resourced students. The findings from this study can inform decisions on how to prepare for future emergencies and help schools support their students during future closures, mitigate against adverse effects on their learning, and provide a safe learning space they can return to when circumstances allow (Vegas 2020; Azevedo et al. 2021; Kim et al. 2021; Spaul and van der Berg 2020; INEE 2020b). Knowledge mobilization theory indicates that policymakers, particularly those engaged with education reform, often must make decisions with limited resources, a lack expertise among their team members, and limited evidence on what might work best (Davies 2012). Our aim with this paper is to contribute evidence to support the Rwandan government's response to mitigate the effects on education of the COVID-19 emergency; above all, how to be fully prepared in terms of the material and nonmaterial resources that can help school leaders and teachers cope with future remote learning and education emergencies.

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REFERENCES

- Adarkwah, Michael Agyemang. 2021a. "An Outbreak of Online Learning in the COVID-19 Outbreak in Sub-Saharan Africa: Prospects and Challenges." *Global Journal of Computer Science and Technology: H Information & Technology* 21 (2): 1-11. <https://computerresearch.org/index.php/computer/article/view/2025>.
- Adarkwah, Michael Agyemang. 2021b. "I'm not against online teaching, but what about us?: ICT in Ghana Post COVID-19." *Education and Information Technologies* 26 (2): 1665-85. <https://doi.org/10.1007/s10639-020-10331-z>.
- Agyei, Douglas Darko. 2021. "Integrating ICT into Schools in Sub-Saharan Africa: From Teachers' Capacity Building to Classroom Implementation." *Education and Information Technologies* 26 (1): 125-44. <https://doi.org/10.1007/s10639-020-10253-w>.
- Al-Fadala, Asmaa, Donvan Amenya, Rachael Fitzpatrick, Katie Godwin, Julia Kirby, and Astrid Korin. 2021. *Rwanda Learning Partnership Insights on School and System Leadership During COVID-19*. www.wise-qatar.org/app/uploads/2021/09/report-21_wise-v7.pdf.
- Azevedo, João Pedro, Amer Hasan, Diana Goldemberg, Koen Geven, and Syedah Aroob Iqbal. 2021. "Simulating the Potential Impacts of COVID-19 School Closures on Schooling and Learning Outcomes: A Set of Global Estimates." *World Bank Research Observer* 36 (1): 1-40.
- Bender, Lisa. 2020. "Guidance for COVID-19 Prevention and Control." *IASC: Inter-Agency Standing Committee*. New York: UNICEF. www.unicef.org/media/66216/file/Key%20Messages%20and%20Actions%20for%20COVID-19%20Prevention%20and%20Control%20in%20Schools_March%202020.pdf.
- Burde, Dana, Amy Kapit, Rachel L. Wahl, Ozen Guven, and Margot Igländ Skarpeteig. 2017. "Education in Emergencies: A Review of Theory and Research." *Review of Educational Research* 87 (3): 619-58. <https://doi.org/10.3102/0034654316671594>.

- Carter, Emma, Phillip Leonard, Anthony Onwuegbuzie, Pauline Rose, and Ricardo Sabates. 2021. "Teaching Quality in Secondary Education in Rwanda: Evidence from STEM Teachers." In *Leaders in Teaching Research and Policy Series*. Cambridge, UK: REAL Centre, University of Cambridge, and Laterite. [https://www.educ.cam.ac.uk/centres/real/publications/Teaching quality in secondary education in Rwanda- Evidence from STEM teachers.pdf](https://www.educ.cam.ac.uk/centres/real/publications/Teaching%20quality%20in%20secondary%20education%20in%20Rwanda-Evidence%20from%20STEM%20teachers.pdf).
- Cheriyian, Panchi, Phil Leonard, Carlo Menon, and Daniela Prigozhina. 2021. "Leadership Development in Secondary School Teachers in Rwanda : Evidence from a Census of Rwandan Secondary Schools." *Leaders in Teaching Research and Policy Series*. Cambridge, UK: REAL Centre, University of Cambridge, and Laterite. <https://www.educ.cam.ac.uk/centres/real/publications/Leadership%20development%20in%20secondary%20school%20teachers%20in%20Rwanda-Evidence%20from%20a%20census%20of%20Rwandan%20secondary%20schools.pdf>.
- Cheriyian, Panchi, Phil Leonard, Pauline Rose, Ricardo Sabates, and Dimitri Stoelinga. 2021. "Understanding the Drivers of Numeracy Assessment Scores in Secondary 3 Classes in 14 Districts in Rwanda." *Leaders in Teaching Research and Policy Series*. Cambridge, UK: REAL Centre, University of Cambridge, and Laterite. <https://www.educ.cam.ac.uk/centres/real/publications/Understanding%20the%20drivers%20of%20numeracy%20assessment%20scores%20in%20Secondary%203%20classes%20in%2014%20districts%20in%20Rwanda.pdf>.
- Cohen, Elisheva, Laura Wangsness Willemsen, Ritesh Shah, Frances Vavrus, Nelson Masanche Nkhoma, Sonja Anderson, Prachi Srivastava and Sarah Dryden-Peterson. 2021. "Deconstructing and Reconstructing Comparative and International Education in Light of the COVID-19 Emergency: Imagining the Field Anew." *Comparative Education Review* 65 (2): 356-74. <https://doi.org/10.1086/713720>.
- Collie, Rebecca J. 2021. "COVID-19 and Teachers' Somatic Burden, Stress, and Emotional Exhaustion: Examining the Role of Principal Leadership and Workplace Buoyancy." *AERA Open* 7: 1-15. <https://doi.org/10.1177/2332858420986187>.
- Cooper, Amanda, Ben Levin, and Carol Campbell. 2009. "The Growing (but Still Limited) Importance of Evidence in Education Policy and Practice." *Journal of Educational Change* 10 (2): 159-71. <https://doi.org/10.1007/s10833-009-9107-0>.

- Davies, Philip. 2012. "The State of Evidence-Based Policy Evaluation and its Role in Policy Formation." *National Institute Economic Review* 219: R41-R52. <https://doi.org/10.1177/002795011221900105>.
- Dreesen, Thomas, Spogmai Akseer, Matt Brossard, Pragya Dewan, Juan-Pablo Giraldo, Akito Kamei, Suguru Mizunoya, and Javier Ortiz. 2020. "Promising Practices for Equitable Remote Learning Emerging Lessons from COVID-19 Education Responses in 127 Countries." Innocenti Research Brief Series. Florence: UNICEF Office of Research.
- Dube, Bekithemba. 2020. "Rural Online Learning in the Context of COVID-19 in South Africa: Evoking an Inclusive Education Approach." *Multidisciplinary Journal of Educational Research* 10 (2): 135-57. <https://doi.org/10.17583/remie.2020.5607>.
- EPDC (Education Policy and Data Center). 2018. *Rwanda National Education Profile 2018 Update*. www.epdc.org/sites/default/files/documents/EPDC_NEP_2018_Rwanda.pdf.
- Dabalen, Andrew, Alvin Etang, Johannes Hoogeveen, Elvis Mushi, Youdi Schipper, and Johannes von Engelhardt. 2016. *Mobile Phone Panel Surveys in Developing Countries: A Practical Guide for Microdata Collection*. World Bank. Washington, DC: World Bank. <https://openknowledge.worldbank.org/bitstream/handle/10986/24595/9781464809040.pdf?sequence=2&isAllowed=y>.
- Firchow, Pamina, and Roger Mac Ginty. 2020. "Including Hard-to-Access Populations Using Mobile Phone Surveys and Participatory Indicators." *Sociological Methods and Research* 49 (1): 133-60. <https://doi.org/10.1177/0049124117729702>.
- Ford, Kath, Catherine Porter, and Alula Pankhurst. 2021. "A Lost Year of Learning for Girls in Ethiopia: Evidence From the Young Lives at Work COVID-19 Phone Survey." Policy paper. Oxford: Young Lives. <https://www.younglives.org.uk/publications/lost-year-learning-girls-ethiopia-evidence-young-lives-work-covid-19-phone-survey> .

- Ford, Kath, and Renu Singh. 2021. "Supporting Vulnerable Girls and Young Women in India: Evidence from the Listening to Young Lives at Work COVID-19 Phone Survey." Policy paper. Oxford: Young Lives. <https://www.younglives.org.uk/publications/supporting-vulnerable-girls-and-young-women-india-evidence-listening-young-lives-work>.
- Gardner, Vicki, Marie Joubert, Angeline M. Barrett, and Leon Tikly. 2018. *Approaches to Strengthening Secondary STEM & ICT Education in Sub-Saharan Africa*. Bristol Working Papers in Education #10/2018. <https://www.bristol.ac.uk/media-library/sites/education/documents/Binder1.pdf>.
- Gourlay, Sydney, Talip Kilic, Antonio Martuscelli, Philip Wollburg, and Alberto Zezza. 2021. "Viewpoint: High-Frequency Phone Surveys on COVID-19: Good Practices, Open Questions." *Food Policy* 105: 1-10. <https://doi.org/10.1016/j.foodpol.2021.102153>.
- GSMA (Global System for Mobile Communications). 2015. *Mobile for Development: MHealth Country Feasibility Report Rwanda*. Kigali, Rwanda: GSMA Association.
- Hallgarten, Joe. 2020. "4 Lessons from Evaluations of the Education Response to Ebola." Global Partnership for Education (blog), April 20, 2020. <https://www.globalpartnership.org/blog/4-lessons-evaluations-education-response-ebola>.
- Hallgarten, Joe, Kristine Gorgen, and Kate Sims. 2020. "Overview of Emerging Country-Level Response to Providing Educational Continuity under COVID-19 What Are the Lessons Learned from Supporting Education in Conflicts and Emergencies That Could Be Relevant for EdTech-Related Responses to COVID-19?." EdTechHub, Education Development Trust, UKaid. <https://edtechhub.org/wp-content/uploads/2020/05/supporting-education-conflict.pdf>.
- Hartenberger-Toby, Lisa. 2020. "Lessons Learned about Remote Learning from Liberia's Ebola Crisis." <https://www.edc.org/blog/lessons-learned-about-remote-learning-liberias-ebola-crisis>.
- Hennessy, Sara, Bjoern Haßler, and Riikka Hofmann. 2015. "Challenges and Opportunities for Teacher Professional Development in Interactive Use of Technology in African Schools." *Technology, Pedagogy and Education* 24 (5): 1-28. <https://doi.org/10.1080/1475939X.2015.1092466>.

- Hoogeveen, Johannes, Kevin Croke, Andrew Dabalén, Gabriel Demombynes, and Marcelo Giugale. 2014. "Collecting High Frequency Panel Data in Africa Using Mobile Phone Interviews." *Canadian Journal of Development Studies/Revue Canadienne D'études Du Développement* 35 (1): 186-207. <https://doi.org/10.1080/02255189.2014.876390>.
- INEE (Inter-agency Network for Education in Emergencies). 2020a. *Technical Note: Education during the COVID-19 Pandemic*. New York: INEE. <https://inee.org/sites/default/files/resources/INEE%20Technical%20Note%20on%20COVID-19%20EN%202020-04-23.pdf>.
- INEE (Inter-agency Network for Education in Emergencies). 2020b. *Weighing up the Risks: School Closure and Re-opening under COVID-19*. New York: INEE. <https://inee.org/resources/weighing-risks-school-closure-and-reopening-under-covid-19>.
- INEE (Inter-agency Network for Education in Emergencies). 2021. *No Education, No Protection: What School Closures under COVID-19 Mean for Children and Young People in Crisis-Affected Contexts*. New York: INEE. <https://inee.org/sites/default/files/resources/CPHA-EiE%20Evidence%20Paper%20-%20No%20Education%20No%20Protection%20v1.1%20LowRes.pdf>.
- Jordan, Katy, Raluca David, Toby Phillips, and Arnaldo Pellini. 2021. "Education during the COVID-19 Crisis Opportunities and Constraints of Using EdTech in Low-Income Countries." *Revista de Educación a Distancia (RED)* 21 (65): 1-15. <https://doi.org/10.6018/red.453621>.
- Khan, Zia., Philip Leonard, and Ricardo Sabates. 2020. "Growing Enrolment, Static Resources : Changes in School Resources and Infrastructure in Relation to Enrolment Trends in Rwandan Secondary Schools." *Leaders in Teaching Research and Policy Series*, December 2020. Cambridge, UK: REAL Centre, University of Cambridge, and Laterite. <https://learningportal.iiep.unesco.org/es/biblioteca/growing-enrolment-static-resources-changes-in-school-resources-and-infrastructure-in>.
- Kim, Janice, Pauline Rose, Dawit Tibebe, Ricardo Sabates, and Tassew Woldehanna. 2021. "Learning Inequalities Widen Following COVID-19 School Closures in Ethiopia." *RISE (blog)*, May 4, 2021. <https://riseprogramme.org/blog/learning-inequalities-widen-COVID-19-Ethiopia>.

- Kimenyi, Eric, Rachel Chuang, and Abeba Taddese. 2020. "EdTech in Rwanda: A Rapid Scan." EdTech Hub. <https://doi.org/10.5281/zenodo.3910001>.
- Klapproth, Florian, Lisa Federkeil, Franziska Heinschke, and Tanja Jungmann. 2020. "Teachers' Experiences of Stress and Their Coping Strategies during COVID-19 Induced Distance Teaching." *Journal of Pedagogical Research* 4 (4): 444-52. <https://doi.org/https://doi.org/10.33902/JPR.2020062805>.
- Laterite. 2017. "Understanding Dropout and Repetition in Rwanda: Full Report for MINEDUC and UNICEF." Kigali, Rwanda: Laterite, Government of Rwanda and UNICEF. https://4det8y3z1n391t76me8rfynx-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/Laterite_UNICEF_MINEDUC_dropout_report_2018.pdf.
- Levin, Ben. 2011. "Mobilising Research Knowledge in Education." *London Review of Education* 9 (1): 15-26. <https://doi.org/10.1080/14748460.2011.550431>.
- Lockee, Barbara B. 2021. "Shifting Digital, Shifting Context: (Re)Considering Teacher Professional Development for Online and Blended Learning in the COVID-19 Era." *Educational Technology Research and Development* 69 (1): 17-20. <https://doi.org/10.1007/s11423-020-09836-8>.
- Maphosa, Vusumuzi. 2021. "Teachers' Perspectives on Remote-Based Teaching and Learning in the COVID-19 Era: Rethinking Technology Availability and Suitability in Zimbabwe." *European Journal of Interactive Multimedia and Education* 2 (1): e02105. <https://doi.org/10.30935/ejimed/9684>.
- Mastercard Foundation. 2020. "Secondary Education Governance in Sub-Saharan Africa: Preparing Youth for the Future of Work." Toronto: Mastercard Foundation. <https://doi.org/10.15868/socialsector.35972>.
- Menon, Carlo, Phil Leonard, and Samuel Nzaramba. 2021. "Gender Gap in Secondary Schools in Rwanda : Background Paper." Leaders in Teaching Research and Policy Series, August 2021. Cambridge, UK: REAL Centre, University of Cambridge, and Laterite. <https://www.educ.cam.ac.uk/centres/real/publications/Gender%20gap%20in%20secondary%20schools%20in%20Rwanda-%20Background%20paper.pdf>.

- Miks, Jason, and John McIlwaine. 2020. "Keeping the World's Children Learning through COVID-19." New York: UNICEF. <https://www.unicef.org/coronavirus/keeping-worlds-children-learning-through-covid-19>.
- Ministry of Education. 2016. "ICT in Education Policy." Kigali, Rwanda: Rwanda Ministry of Education. <https://www.mineduc.gov.rw/index.php?eID=dumpFile&t=f&f=5830&token=7fa027ccbfb5c448c118de1e6f1b81a373fbadc>.
- Ministry of Education. 2018. *Republic of Rwanda Ministry of Education Education Sector Strategic Plan 2018/19 to 2023/24*. Education Sector Strategic Plan. Kigali, Rwanda: Rwanda Ministry of Education. www.globalpartnership.org/sites/default/files/document/file/2020-22-Rwanda-ESP.pdf.
- Ministry of Education. 2019. "2019 Education Statistics." Kigali, Rwanda: Rwanda Ministry of Education. <https://www.mineduc.gov.rw/index.php?eID=dumpFile&t=f&f=41937&token=8398e453fecb7a596f8c4acbce94ecc530656547>.
- Ministry of Education. 2020a. *2019/20 Backward-Looking Joint Review of the Education Sector*. Kigali, Rwanda: Rwanda Ministry of Education. www.mineduc.gov.rw/fileadmin/user_upload/Mineduc/Publications/REPORTS/JRES_REPORTS/BACKWARD-LOOKING_JRES/2019-2020_BL_JRES_REPORT.pdf.
- Ministry of Education. 2020b. "Keeping the Doors Open for Learning: Response Plan of Ministry of Education to the COVID-19 Outbreak." Kigali, Rwanda: Rwanda Ministry of Education. www.mineduc.gov.rw/fileadmin/user_upload/Mineduc/Publications/REPORTS/Education_Sector_COVID_Plan_Rwanda.pdf.
- Ministry of Education. 2020c. "School Year Calendar 2020-2021." Kigali, Rwanda: Rwanda Ministry of Education. www.mineduc.gov.rw/fileadmin/user_upload/Mineduc/ANNOUNCEMENTS/Updated_School_Year_Calendar_2020-2021.pdf.
- Ministry of Finance and Economic Planning. 2000. "Rwanda Vision 2020." Kigali: Government of Rwanda. <https://repositories.lib.utexas.edu/bitstream/handle/2152/5071/4164.pdf>.

- Mitchell, Rafael, Jennifer Agbaire, Julia Paulson, Terra Sprague, and Leon Tikly. 2022. "Endogenous Systems Leadership for Education in Crises: A Framework for Inclusive and Equitable Quality Education in Low- and Middle-Income Countries." Bristol Working Papers in Education #03/2022. Bristol, UK: University of Bristol. <https://zenodo.org/record/6393355#YyRkRezMJhF>.
- Mugiraneza, Jean Pierre. 2021. *Digitalisation in Teaching and Education in Rwanda*. Geneva, Switzerland: International Labour Organization. www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/publication/wcms_783668.pdf.
- Mushimiyimana, Jean de Dieu. 2021. "School Management and Effective Use of Smart Classroom in Teaching and Learning Process." *Teaching and Learning Process* 9 (4): 4-13. http://www.voiceofresearch.org/doc/Mar-2021/Mar-2021_2.pdf.
- Mutula, Stephen M. 2003. "Bridging the Digital Divide through Schools." *IASL Annual Conference Proceedings*, 297-309. University of Alberta Libraries. <https://doi.org/10.29173/iasl7558>.
- Nthenya, Athanas Julian, David Kibe, David Kibe Muchiri, Paul Njoroge Kagori, and Phineas Zaberio Mawira. 2021. "Challenges and Issues of Online Education in Sub-Saharan Africa amid the COVID-19 Pandemic." *International Journal of Multidisciplinary Research and Publications (IJMRAP)* 3 (10): 40-48. https://www.researchgate.net/publication/351839435_Online_2581-6187Challenges_and_Issues_of_Online_Education_in_Sub-Saharan_Africa_amid_the_COVID-19_Pandemic.
- OECD (Organization for Economic Cooperation and Development). 2018. *Bridging the Digital Gender Divide*. Organization for Economic Cooperation and Development (OECD). www.oecd.org/digital/bridging-the-digital-gender-divide.pdf.
- REB/MINEDUC (Rwanda Education Board/Ministry of Education). 2015. "Competence-Based Curriculum: Curriculum Framework Pre-Primary to Upper Secondary." Kigali, Rwanda. Rwanda Education Board/Ministry of Education.

- Reimers, Fernando, and Andreas Schleicher. 2020. *Schooling Disrupted, Schooling Rethought: How the COVID-19 Pandemic Is Changing Education*. Organization for Economic Cooperation and Development (OECD). https://read.oecd-ilibrary.org/view/?ref=133_133390-1rtuknc0hi&title=Schooling-disrupted-%20schooling-rethought-How-the-COVID-19-pandemic-is-changing-education%20.
- Rigall, Anna. 2020. "What Does 'Build Back Better' Mean in the Context of Educating the World's Children Post-COVID-19?" Education Development Trust. <https://www.educationdevelopmenttrust.com/our-research-and-insights/commentary/what-does-'build-back-better'-mean-in-the-context->.
- Rose, Pauline, Aslam Monazza, Phoebe Downing, Romanshi Gupta, Brian Law, Maria-José Ogando Portela, Shenila Rawal, and Katherine Stewart. 2021. "Independent Evaluation of the Girls' Education Challenge Phase II—Teachers and Teaching for Marginalised Girls." Reading, Berkshire, United Kingdom: Tetra Tech International Development Ltd.
- Rubagiza, Jolly, Edmond Were, and Rosamund Sutherland. 2011. "Introducing ICT into Schools in Rwanda: Educational Challenges and Opportunities." *International Journal of Educational Development* 31 (1): 37-43. <https://doi.org/10.1016/j.ijedudev.2010.06.004>.
- Selwyn, Neil. 2020. "Digital Education in the Aftermath of COVID-19: Critical Concerns and Hopes." *Teclash #01*, 2020. Monash University, Australia. <https://der.monash.edu/wp-content/uploads/2020/06/TECHLASH-01-COVID-education.pdf>.
- Spaull, Nic, and Servaas van der Berg. 2020. "Counting the Cost: COVID-19 School Closures in South Africa and Its Impact on Children." *South African Journal of Childhood Education* 10 (1): 1-13. <https://doi.org/10.4102/sajce.v10i1.924>.
- Srivastava, Prachi, Alejandra Cardini, Iván Matovich, Hugues Moussy, Amélie A. Gagnon, Robert Jenkins, Nicolas Reuge, Kate Moriarty, and Sonja Anderson. 2020. *COVID-19 and the Global Education Emergency: Planning Systems for Recovery and Resilience*. Saudi Arabia. G20 Insights. https://www.g20-insights.org/policy_briefs/covid-19-and-the-global-education-emergency-planning-systems-for-recovery-and-resilience/.

- Tadesse, Seble, and Worku Muluye. 2020. "The Impact of COVID-19 Pandemic on Education System in Developing Countries: A Review." *Open Journal of Social Sciences* 08 (1): 159-70. <https://doi.org/10.4236/jss.2020.810011>.
- Tedla, Berhane Aradom. 2012. "Understanding the Importance, Impacts and Barriers of ICT on Teaching and Learning in East African Countries." *International Journal for E-Learning Security* 2 (2): 199-207. <https://doi.org/10.20533/ijels.2046.4568.2012.0025>.
- UNESCO (United Nations Educational, Scientific and Cultural Organization). 2020. *Supporting Teachers in Back-to-School Efforts Guidance for Policy-Makers*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO). <https://unesdoc.unesco.org/ark:/48223/pf0000373479>.
- UNESCO (United Nations Educational, Scientific and Cultural Organization). 2021. *When Schools Shut: Gendered Impacts of COVID-19 School Closures*. Paris: United Nations Educational, Scientific and Cultural Organization (UNESCO).
- UNICEF (United Nations International Children's Emergency Fund). 2020. "Averting a Lost COVID Generation." United Nations International Children's Emergency Fund (UNICEF). <https://www.unicef.org/reports/averting-lost-generation-covid19-world-childrens-day-2020-brief>.
- Van-Deursen, Alexander, and Jan Van-Dijk. 2019. "The First-Level Digital Divide Shifts from Inequalities in Physical Access to Inequalities in Material Access." *New Media and Society* 21 (2): 354-75. <https://doi.org/10.1177/1461444818797082>.
- Van-Lancker, Wim, and Zachary Parolin. 2020. "COVID-19, School Closures, and Child Poverty: A Social Crisis in the Making." *The Lancet. Public Health* 5 (5): e243-44. [https://doi.org/10.1016/S2468-2667\(20\)30084-0](https://doi.org/10.1016/S2468-2667(20)30084-0).
- Vegas, Emiliana. 2020. "School Closures, Government Responses, and Learning Inequality around the World during COVID-19." Washington, DC: The Brookings Institution. <https://www.brookings.edu/research/school-closures-government-responses-and-learning-inequality-around-the-world-during-covid-19/>.

- Vu, Binh Thanh, and Isil Oral Savonitto. 2020. "Building Back Better: Education Systems for Resilience, Equity and Quality in the Age of COVID-19." Education Global Practice, World Bank. <https://documents1.worldbank.org/curated/en/497341595425543327/Building-Back-Better-Education-Systems-for-Resilience-Equity-and-Quality-in-the-Age-of-COVID-19.pdf>.
- World Bank. 2020. "Rwanda Quality Basic Education for Human Capital Development Project (P168551)." The World Bank Group. <https://documents1.worldbank.org/curated/en/273841589207337483/pdf/Disclosable-Version-of-the-ISR-Rwanda-Quality-Basic-Education-for-Human-Capital-Development-Project-P168551-Sequence-No-02.pdf>.
- Yorke, Louise, Janice Kim, Belay Hagos Hailu, and Chaniew Ejigu Berhie. 2021. "Practical and Ethical Challenges of Doing Distance Research in the Global South During a Global Pandemic." RISE (blog), April 16, 2021. <https://riseprogramme.org/blog/practical-ethical-challenges-distance-research-Global-South-pandemic>.
- Yorke, Louise, Pauline Rose, Belay Hagos, and Tassew Woldehanna. 2020. *The Effect of COVID-19 on Primary Education in Ethiopia: Perspectives of School Principals and Teachers*. REAL Centre, Research and Policy Paper, 20/10. Cambridge, UK: REAL Centre, University of Cambridge. www.educ.cam.ac.uk/centres/real/publications/Effects%20of%20COVID-19%20on%20principals%20and%20teachers_Ethiopia.pdf.