Rwanda EQUIP Education Quality Improvement Program

A Government of Rwanda Initiative

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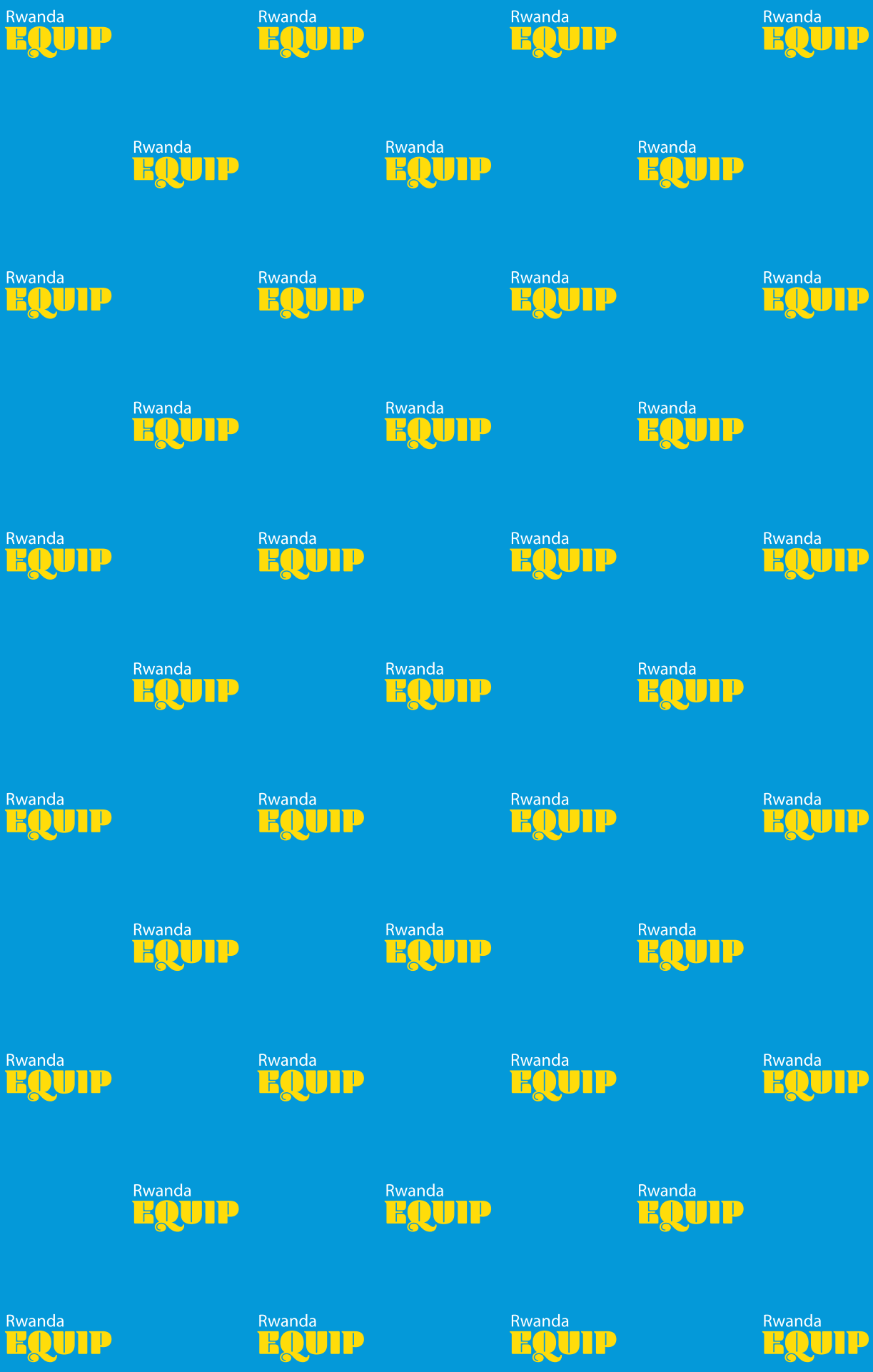
Evidence from government schools in Rwanda

By the end of the 2022-23 school year after 47 weeks of programme implementation


Rwanda
EQUIP

Can Data-Informed Management and Structured Pedagogy Improve Learning?

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By the end of the 2022-23 school year after 47 weeks of programme implementation

Daniel Rodriguez-Segura, Philbert Rugwizangoga, Keuna Cho, Priscilla Lu, Savannah Tierney, Jinrong Zuo, and Elisabeth Jeanette Turner

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Executive Summary

To elevate learning outcomes across the country, the Government of Rwanda launched RwandaEQUIP in January 2022 as a holistic model of educational transformation.

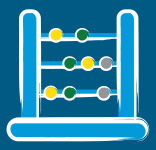
By the end of the 2022-23 school year, the programme has expanded to serve 330,000 pupils from 250 schools across all five provinces.

Prior to the launch of RwandaEQUIP, pupils' foundational literacy and numeracy skills were very weak.

9 in 10 pupils in a typical Primary 1 class could not read a single word in English, and more than half of these pupils could not read a single word in Kinyarwanda. In maths, fewer than 5% pupils in a typical Primary 2 class demonstrated a grade-appropriate proficiency in foundational numeracy skills.

After 47 weeks of programme implementation, pupils displayed substantial growth in English literacy skills.

- The share of non-readers in a typical Primary 1-2 class decreased by more than half.
- The average pupil in a Primary 1-2 classroom improved their English reading fluency by 10-12 cwpm, which is more than double the rate of growth observed in comparison schools.
- RwandaEQUIP pupils in Primary 1 improved their reading comprehension skills at three times the rate of their peers in comparison schools and nearly twice the rate of Primary 2 pupils in comparison schools.
- The large gains achieved in English literacy in Primary 1 and 2 are in the top 5% of all education interventions in low- and middle-income contexts.



Pupils also made large strides in maths after 47 weeks.

- RwandaEQUIP more than doubled the pace of learning in single-digit addition and subtraction for pupils in a typical Primary 1 classroom.
- In the average Primary 2 class, RwandaEQUIP pupils' multiplication skills improved by 7 percentage points more than in comparison schools.

RwandaEQUIP more than doubled the share of pupils reaching government-developed grade-level benchmarks.

At the end of the 2022-23 school year, 43% of Primary 1-2 pupils met the National Examination and School Inspection Authority's (NESA) grade-level English benchmarks from 2022, compared to 19% of pupils in comparison schools.

Pupils achieved significant learning gains under teachers with varying levels of English fluency.

The findings reveal that average teacher English fluency is, at best, weakly correlated with average pupil growth across RwandaEQUIP schools, highlighting the broader effectiveness of the structured pedagogy support provided by the programme.

There have been significant improvements in teacher attendance, pedagogical practices, and classroom behaviours since the start of RwandaEQUIP.

For instance, the rate of teacher absenteeism decreased from 34% to 11%, and the lesson completion rate surged from 17% in the first five weeks of the programme to 77% by the end of the most recent term.

RwandaEQUIP is committed to increasing the amount of high-quality instructional time that children receive.

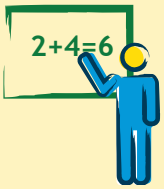
- As such, where infrastructure allows, RwandaEQUIP sought to transition as many double-shift classes to single-shift. For the first phase of schools that entered the programme, 75% of all eligible classes were transitioned to a single-shift model.
- Single-shift schools saw larger learning gains than their counterparts who remained in the double-shift system, highlighting the importance of maximising children's opportunities to learn within the classroom.
- After 47 weeks, the average RwandaEQUIP pupil is now experiencing more than 18 additional hours of high-quality instruction per week than before the programme.

In Numbers, After 47 Weeks of Instruction:

7 **additional cwpm gained by Primary 1** pupils relative to comparison schools

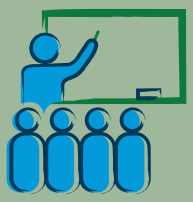
53 percentage point (70%) **reduction in non-readers** in a typical Primary 2 classroom

3x **improvement in reading comprehension** relative to comparison schools



25 percentage point gain in **single-digit addition scores** for pupils in a typical Primary 1-2 classroom

2x as many pupils meet NESA's **grade-level benchmarks** relative to comparison schools



23 percentage point (68%) **reduction in teacher absenteeism**

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ATLANTIC OCEAN

I. Preamble

Foreword by the Managing Director of RwandaEQUIP, Clement Uwajeneza

Rwanda's Vision 2050 articulates the long-term strategic direction for "the Rwanda we want". Achieving these aspirations will require bold and decisive action. Human Development is one of the five pillars of Vision 2050 and the golden ticket to a better life. One of the priorities in this pillar includes universal access to high-quality education. Thus, Rwanda has put education at the centre of its development goals. The Education Sector Strategic Plan (ESSP), 2018/2019 – 2023/2024, recognises school readiness programmes and strong learning outcomes as vital foundations for the future of the educational system as it serves the needs of Rwandan children from all backgrounds.

RwandaEQUIP (Rwanda Education Quality Improvement Programme) is the Government of Rwanda's transformative programme to make the country's basic education system globally competitive. The programme intends to do so by building on existing investments and policies set by the Government of Rwanda to deliver the last-mile solution that will improve the quality of education and instruction in public Primary schools. The primary and direct beneficiaries of the project are public and government-subsidised pre-Primary and Primary schools, teachers, and all relevant school leaders. The programme places education at the heart of the community, empowering parents and community leaders to support the Government's transformative programme and build a brighter future for their country.

With a mission to strengthen the quality of education in 761 schools in all five provinces of Rwanda in 4 years, the programme launched its activities in January 2022, starting with 100 schools across 13 districts. In the 2022-23 school year, the programme expanded to an additional 150 schools, reaching 330,000 children nationwide.

In its first 47 weeks of implementation, the programme has shown its potential to accelerate improvements of Rwanda's basic education with tremendous achievements in literacy and numeracy, as evidenced in the present report. The report provides detailed insights into RwandaEQUIP and its impact on the supported schools. It also highlights areas of focus for the future.

This measurement and evaluation work, and the success of the programme more broadly, would not have been possible without the support of the local leaders, head teachers, teachers, students, and RwandaEQUIP Team. We highly appreciate this commitment.

We want to thank our country's leadership that can envision this programme's impact and endorse it. We also acknowledge partners and friends of the programme.

Clement Uwajeneza

Acknowledgements

The successful completion of this study is due to the support and instrumentality of many people. We would first like to thank the Ministry of Education (MINEDUC), including Hon. Gaspard Twagirayezu, Hon. Claudette Irere, Permanent Secretary, Mr Charles Karakye, and DG Christophe Nsengiyaremye, as well as Dr Bahati Bernard and the National Examination and School Inspection Authority (NESA), and Dr Mbarushimana Nelson and the Rwanda Basic Education Board (REB) for their deep commitment to the rigorous measurement and evaluation process. This study would not be possible without their support.

We would also like to thank all school head teachers and teachers who welcomed the study teams into their schools and classrooms. We are grateful for the input and guidance of Clement Uwajeneza, Dr Shannon May, Tim Sullivan, Michael Kang, Melanie Gaudet, Marlee Mullane, and Tobias Mitchell.

Finally, we owe our deepest gratitude to the field team, the backbone of this project: Jean Damascene Sibomana, Denys Hategekimana, Benjamin Protais Mugenzi, Elias Rumanzi, Pacifique Amikoro, Marie Claire Kamanzi, Jean Claude Habihirwe, Noah Mutsinzi, Valens Macumu, Eric Bazimaziki, Berthille Berwa Ishimwe, Aline Uwamariya, Pacifique Uwiringiyimana, Maurice Uwifashije, Emmanuel Mbarushimana, Kevin Nshimiyimana, Donatha Mukamuzima, Delphine Ingabire, Singenuye Gaspard, Edgard Kevin Rugoro, Marie Alice Dusabeyezu, Denyse Mushimiyimana, Alphonse Nkundimana, Emmanuel Niyonsaba, Deo Tuyishime, Thomas Munyaneza, Eric Nsengimana, Jean D'amour Ndayisenga, Egide Twagirayezu, Emmanuel Ntaganira, Innocent Harelimana, Hildbrand Muhirwa, Hilarie Nishyirimbere, Deo Tuyisenge, Evangeline Irakoze, Jean Paul Nshimiyimana, Marius Derick Gashagaza, Asumpta Imbabazizayo, Jean Bosco Mwizerwa, Hakizimana Emmanuel, Jean De Dieu Nzayisenga, Bruno Nkundineza, Jean Ndikuryayo, Lovely Cyprien Sindayigaya, Mutuyeyezu Alexis, Hategekimana Eric, Clotilde Kanyamugenge, Muhoza Patrick, Barakagwira Marie Rose, Stella Uwantege, Mukandoba Claudine, Umutoni Francine, Shema Roger, Mkombozi Eric, Mukabunane Donatha, Wihogora Racel Phiona, Muhoracyeye Christella, Prince Imani, Ayimana Gilbert, Mukeshimana Florence, Nsengiyumva Gildas, Rutayisire Olivier, Ishimwe Arlettte, Solange Umutoni, Uwineza Felicite, Muhongayire Marie Claire, Ishimwe Blandine, Ndahayo Jerome, Uwimpuhwe Claire, Nyabyenda Eric, Umutoniwase Nadine, Ingabire Janviere, Uwamahoro Anisie, Nzabonimpa Pierre Claver, Muganineza Arsene, Mutesi Justine, Theoneste Uwanyirijuru, Gahima Cosmas, Uwanyirigira Devotha, Tuyishime Jean Claude, Mugabo Cedric, Usabyimana Anglique, Nyinawabega Modesta, and Igiraneza Nithia Cora.

II. About RwandaEQUIP

Overview of the Programme

The Rwandan Government put forth a bold vision to transform the quality of public education across the country in order to ensure that all pupils reach their full potential. In January 2022, it launched the Rwanda Education Quality Improvement Programme (RwandaEQUIP). RwandaEQUIP is a holistic, 360-degree programme strengthening all aspects of the public Primary education system. Through RwandaEQUIP, school leaders and teachers are empowered to deliver transformative education to each child. The programme is dedicated to equipping all pupils with mastery in foundational skills, encompassing reading, language, and mathematics.

RwandaEQUIP is anchored in 5 core pillars:

1. Scientifically-based learning materials aligned to the Rwandan National curriculum
2. A technology-enabled instructional model
3. Data-driven training, coaching, and ongoing professional development
4. 360-degree support teams
5. Technology-driven monitoring and reporting

The programme has five central goals:

- To support the Rwandan Government to better utilise the existing human and material resources allocated to the public education system
- To build capacity among school leaders and teachers, training them in the use of effective and scientifically-based instructional practices that create learning-centric classrooms
- To establish management structures that enable effective governance and ultimately increase the quantity and quality of instruction time that each pupil receives
- To provide materials that enhance the quality of teaching and learning within each classroom
- To raise learning levels in both foundational skills and in subjects covered by the national curricula

The first day of class for RwandaEQUIP was in February 2022, at the start of the second term for the 2021-22 school year. Upon its launch, 100 schools from 13 districts participated in the programme, training more than 3,000 teachers and reaching over 125,000 pupils. During the second year of programme execution — the 2022-23 school year — RwandaEQUIP expanded to an additional 150 schools, reaching 330,000 pupils from a total of 250 schools across all five provinces in the country. The following report details the study conducted for the first 47 weeks of the programme, Phases 1 and 2, providing a descriptive analysis of the RwandaEQUIP effect on learning and leveraging four total rounds of data collection from before the start of the programme up until the end of the second school year.

The Timeline of This Study

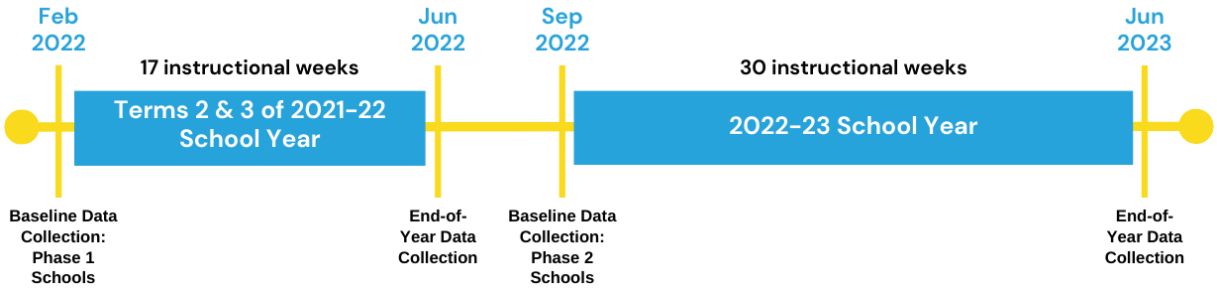


Figure 2.1

RwandaEQUIP: A Holistic Programme with Integrated Features

Academic planning and lesson mapping

RwandaEQUIP drives pupil learning by providing school leaders and teachers with the tools and support they need to deliver life-changing education to each and every child. Moreover, RwandaEQUIP also offers government and programme leaders visibility into the minute-by-minute experience of pupils, teachers, and schools. This digital and operational transparency ensures that leaders can work in close collaboration and make strategic, data-driven decisions to improve the quality of education on a system-wide scale. Importantly, RwandaEQUIP schools remain under the purview of the Rwanda Ministry of Education. As such, they receive the same level of scrutiny and monitoring as do other public schools in Rwanda outside of the programme. The key difference is that public schools under RwandaEQUIP receive the additional support provided by the programme.

Below, we highlight the core pillars that enable RwandaEQUIP to ensure high-quality learning in each and every classroom:

1. Scientifically-Based Learning Materials Aligned with National Curriculum

One key pillar of RwandaEQUIP is the materials that teachers use to ensure that all pupils master the curriculum and build the necessary foundational literacy and numeracy skills to excel in their studies. RwandaEQUIP designs thousands of high-quality, syllabus-aligned teacher guides. Each teacher guide is based on thousands of hours of research and development on what works best to drive learning gains. These scientifically-based lessons provide the necessary structure and pedagogical support to lead a world-class lesson. This includes key lesson objectives, procedures for teaching new concepts, impactful and rigorous independent practice opportunities, and mechanisms for assessing learning. Each lesson is then observed in the classroom to ensure that there is a continuous cycle of improvement.

RwandaEQUIP enables the teaching of the national curriculum, while also building foundational skills that serve as the building blocks that allow access to all curricular content. RwandaEQUIP's lesson materials cover all curriculum-mandated subjects, and include lessons that strengthen the core foundational literacy and numeracy skills necessary for pupils to meaningfully engage with and master the content in the national curriculum. Importantly, lesson content in the foundational areas is levelled — that is, adjusted to actual learning levels as measured in schools — so that instruction can be aligned with pupils' current learning needs. RwandaEQUIP aims to meet pupils where they are, thus more effectively raising learning levels and guiding progress towards grade-level standards.

The quality of instructional materials is constantly evaluated through several mechanisms. First, continuous and comprehensive assessments of pupils' learning are administered termly, and the data are automatically captured from these assessments, providing ongoing visibility into pupils' progress across the entire system. Second, RwandaEQUIP programme officers observe lessons each day, evaluating the quality of the design and opportunities for improvement. This continuous cycle of observation and iteration ensures that each and every lesson drives effective classroom instruction and contributes to optimised learning outcomes (For more information regarding structured pedagogy, see Box 1).

2. Technology-Enabled Instructional Model

RwandaEQUIP's instructional model is made possible by technology. Teacher guides are shared digitally with teachers through a teacher tablet. These digital teacher guides not only deliver high-quality academic content, but also enable the consistent implementation of pedagogical strategies to ensure that teachers are engaging all pupils. For example, teachers are provided with prompts to pause for pupil questions or to facilitate small-group sessions, and they can track which pupils they have called on, so that they can be sure to call on others. Technology also enables the efficient allocation of time, ensuring that every minute of the school day maximises learning. Lessons are organised by a digital timetable, and the teacher tablet automatically tracks the amount of time spent on each page of a lesson, providing insights into time-on-task. When teachers assess learning outcomes, they do so using an application on their teacher tablet, called Let's Mark, which allows fast and automated marking of exams. The tablet, in turn, provides the teacher with the data and insights necessary to adjust their instruction based on the actual learning outcomes and patterns in their classroom. From the delivery of lesson content to supporting strong pedagogical practices to enabling time management, technology enables RwandaEQUIP's instructional model.

3. Data-Driven Training, Coaching, and Ongoing Professional Development

High-quality instructional materials are necessary but not sufficient to transform teaching and learning in the classroom; in addition, teachers need professional development, as well as ongoing support from school leaders. Another key component of RwandaEQUIP is data-driven professional development programmes. Additional induction training sessions are scheduled at each expansion phase of the programme.

RwandaEQUIP induction training has three core objectives:

- To ensure that every teacher has the **skills and knowledge** to deliver lessons, manage a classroom, assess learning, and motivate pupils.
- To develop the **mindset** that every pupil can be successful, that high-quality instruction is possible and leads to improved learning outcomes, and that positive reinforcement is the most effective tool to motivate pupils.
- To strengthen the **communication strategies** needed to engage with the school community and beyond.

A teacher's support does not end with induction training. RwandaEQUIP also provides continuous professional development for teachers. This professional development, delivered at the school level by a Schools Supervisor, reinforces core skills from induction training. It delivers training on new processes, skills, and tools in the programme.

Importantly, RwandaEQUIP empowers school leaders to provide powerful coaching for their teachers. School leaders receive frequent visits from supervisors, during which they conduct joint lesson observations and hone their skills in providing improved feedback to teachers. Thus equipped with the tools and training to monitor performance and observe teachers, school leaders can observe teachers and deliver coaching sessions that celebrate areas of strength and target areas of growth. Coaching, alongside continuous professional development, ensures that every single teacher receives constant feedback and reinforcement of the skills that help them to become a stronger teacher.

4. 360-Degree Support Teams

RwandaEQUIP knows that to be successful, systems must be put in place to ensure that all members of the school ecosystem deliver the programme with fidelity. A 360-degree support team ensures that at every school, all of the conditions are in place for learning. This includes operational factors (Is there a teacher assigned to every classroom? Does every teacher have a tablet?). It also includes performance indicators (What percentage of lessons are teachers delivering each day? Are teachers taking attendance for their classrooms?). A team of Schools Supervisors checks in with schools daily, and visits in person every other week to ensure that these conditions are met. When issues surface, a support team responds in order to resolve these issues. This includes IT support, operational support, and other departments — such as a school audit team that performs remote digital audits and in-school field audits to confirm data integrity and human action — to ensure optimal conditions for learning.

5. Technology-Driven Monitoring and Reporting

The identification and resolution of school-based issues does not only occur during in-person visits. RwandaEQUIP tracks all core operational and performance drivers that contribute to learning outcomes, such as pupil and teacher attendance, lesson completion, school leader coverage, and more. Digital tools capture these data automatically and in a decentralised manner; for example, teachers do not need to manually log lesson completion, and school leaders do not need to take teacher attendance. Technology then transforms these data into usable insights for school leaders, which, in turn, enables more effective school management and teacher coaching. These data are also used by RwandaEQUIP's 360-degree support team to identify challenges, resolve issues, support school leaders, and drive improvement at the school level. These data are also available for government and RwandaEQUIP leadership. These insights inform strategic decisions at the programme level and ensure that all key programme decisions are responsive to the reality of the school system as a whole.

Box 1

Enhancing Learning Outcomes Through Structured Pedagogy

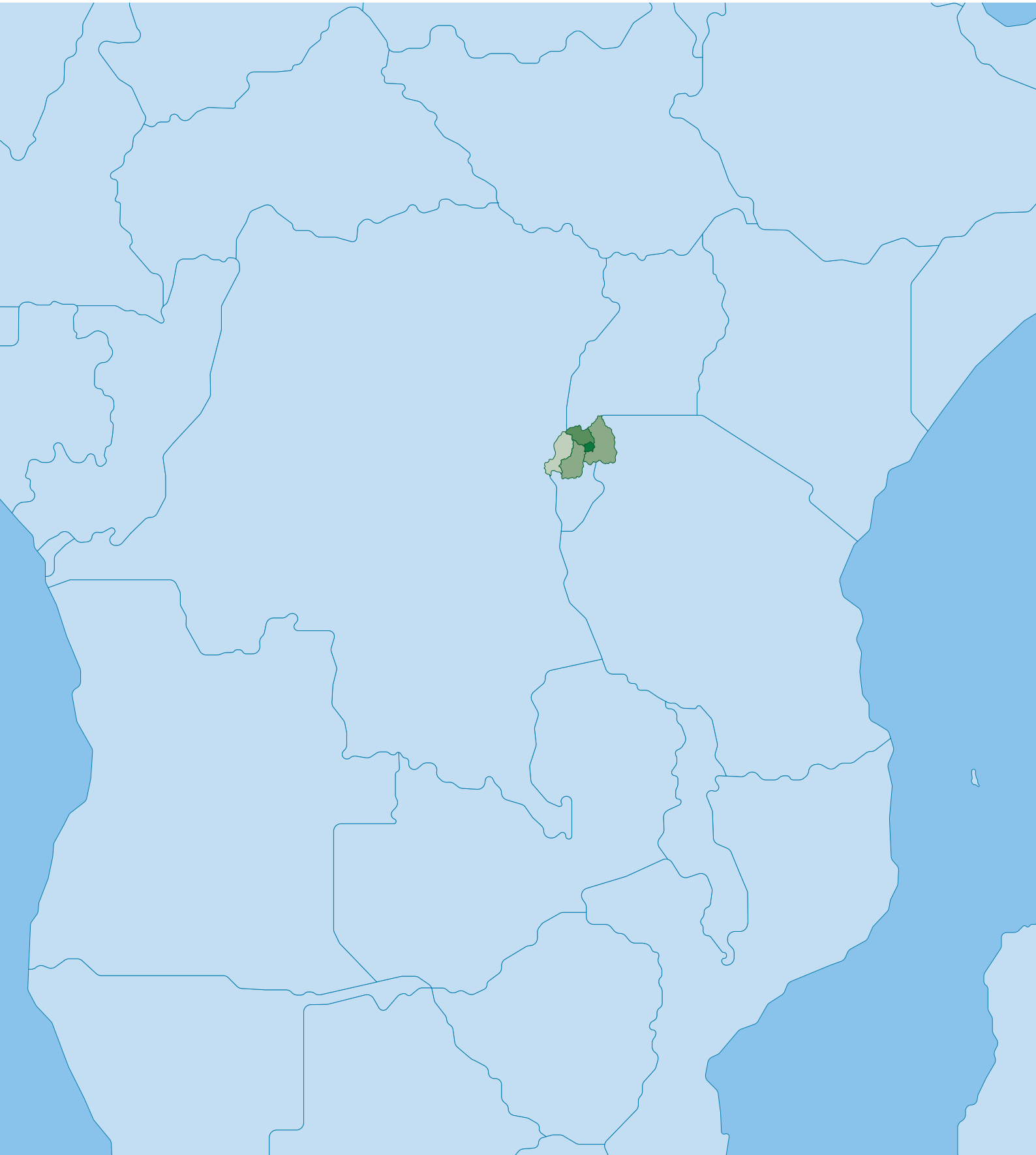
Classroom instruction is one of the most important components of an educational system. Teacher and lesson quality have a greater impact on pupil achievement than any other school-level factors (World Bank, 2018). The absence of effective instructional practices can consequently render education inputs and systems futile. One of the most effective ways to maximise instructional quality at scale is to incorporate appropriately scaffolded lessons and curricula which enhance retention, employ proven instructional strategies, and are facilitated by educators who possess a comprehensive understanding of subject matter. Unfortunately, classroom instruction in many low- and middle-income countries lack these critical characteristics. Data collected from 2,600 schools over 7 countries in Sub-Saharan Africa show that approximately 14% of grade 4 language teachers could not spell a simple word like “traffic”, and a similar share could not correctly answer questions on a simple grammar exercise. Moreover, even when teachers did possess an adequate amount of subject matter expertise, it did not guarantee their ability to communicate knowledge to pupils. The same study found that only 31% of teachers were able to independently prepare a lesson plan, and an even smaller share of teachers could develop lesson objectives, formulate questions to check pupils’ understanding, and give feedback (Bold et al., 2017). Given the challenges many teachers face regarding lesson planning, competing time demands, school understaffing, and absenteeism rates, it is highly probable that educators lack both the time and capacity required to develop comprehensive course syllabi.

As defined by the World Bank, structured pedagogy is a package for educational systems that consists of lesson plans, learning materials, and ongoing teacher training. Structured pedagogy has been classified as a highly cost-effective intervention by an advisory panel of international education experts (GEEAP, 2023). This makes pedagogy reform particularly attractive for countries who are facing budgetary challenges and inequitable learning outcomes, as it equips teachers with expertly developed and coherent materials, benefiting pupils regardless of external factors such as location, income, or background (World Bank et al., 2023). Evidence indicates that structured pedagogy has significantly improved learning outcomes in several LMICs. For instance, the RARA (Nigeria Reading and Access Research Activity) program focusing on supporting teachers with lesson plans and effective strategies resulted in substantial oral fluency gains for Primary 2 pupils, equivalent to almost half a year of additional schooling (RTI International, 2015). Similar patterns were observed in a 2018 study by Research Triangle International (RTI), which highlighted the contribution of structured lesson plans to improved learning outcomes across 19 education programmes in 13 countries (Piper et al., 2018). In a randomised control trial conducted by a group

of education experts led by Nobel Prize-winner Dr. Michael Kremer, pre-Primary and Primary pupils enrolled in Kenyan schools using structured pedagogy for two years experienced average learning gains equivalent to 1.5 and 0.8 additional years of schooling respectively, (Gray-Lobe et al., 2022). A comparable model evaluated in government schools in Rwanda also yielded substantial gains after only 17 weeks of instruction (Rodriguez-Segura et al., 2023). While evidence supports the positive impacts of structured pedagogy, it is important to note that this intervention is not a panacea in its ability to improve learning outcomes.

The efficacy of structured pedagogy relies on well-crafted implementation, comprehensive support, and monitoring. Empirical research indicates that in the absence of research supported methodologies and trained educators, structured pedagogy can lead to diminished or negligible effects on learning outcomes. In Sub-Saharan African school systems between 1990 and 2010, despite the provision of new lesson plans and materials, learning outcomes stagnated due to inadequate teacher training (Hassan et al., 2022). Similar studies in Kenya, Uganda, and Malawi found that after implementing reformed pedagogy, teachers who received minimal training exhibited lower levels of effectiveness (Piper et al., 2018). To address this issue, robust monitoring mechanisms are essential. The same 2018 study has shown that incorporating effective teaching aids, prioritising core competencies like literacy and comprehension, and reinforcing prior knowledge positively impacts learning outcomes. Through effective implementation strategies, resources tailored to diverse classroom settings, and comprehensive training, structured pedagogy can empower teachers to facilitate meaningful educational experiences for pupils.

III. Methodology



In executing the study methodology, the Measurement and Evaluation strategy had two objectives: (1) to track progress observed in RwandaEQUIP schools, and (2) to benchmark gains in light of other schools outside of the programme. Achieving this required following a strategy based on the careful monitoring of learning outcomes within schools that joined in Phase 1 and Phase 2, as well as within those schools where the programme did not rollout in Phase 1.

Schools Included in the Study

In "Phase 1" of RwandaEQUIP, the programme served 100 schools during Terms 2 and 3 of the 2021-22 school year (17 instructional weeks). In "Phase 2", the programme expanded to serve an additional 150 schools during the full 2022-23 school year (30 instructional weeks). Phase 1 schools were in the programme for 47 weeks. In this report, unless otherwise stated, results are aggregated for the programme, weighted by the total number of pupils that joined in each phase.

In Phase 1 of RwandaEQUIP (Term 2 & 3 of the 2021-22 school year), the sample consisted of a set of 60 public Primary schools across Rwanda. Of these schools, 30 schools were part of RwandaEQUIP ("treatment" schools) and 30 were non-RwandaEQUIP schools ("comparison" schools). In selecting which particular schools would comprise the set of 60 schools for this study, there were three goals in mind. These goals were to ensure that (1) the subset of 30 treatment schools was representative of the broader set of 100 RwandaEQUIP schools, (2) the subset of 30 comparison schools closely resembled the 30 treatment schools in terms of school characteristics, so that they would be a reliable comparison, and (3) jointly, the 60 schools resembled the broader set of 100 RwandaEQUIP schools as much as possible, so that the estimated effects of the programme would be generalisable to the full set of 100 RwandaEQUIP schools that joined during Phase 1 (see Table 1 in Appendix C for a comparison of characteristics across the different groups of schools). These relationships are illustrated between the different subsets of schools below (Figure 3.1):

The Relationship Between Treatment and Comparison Schools

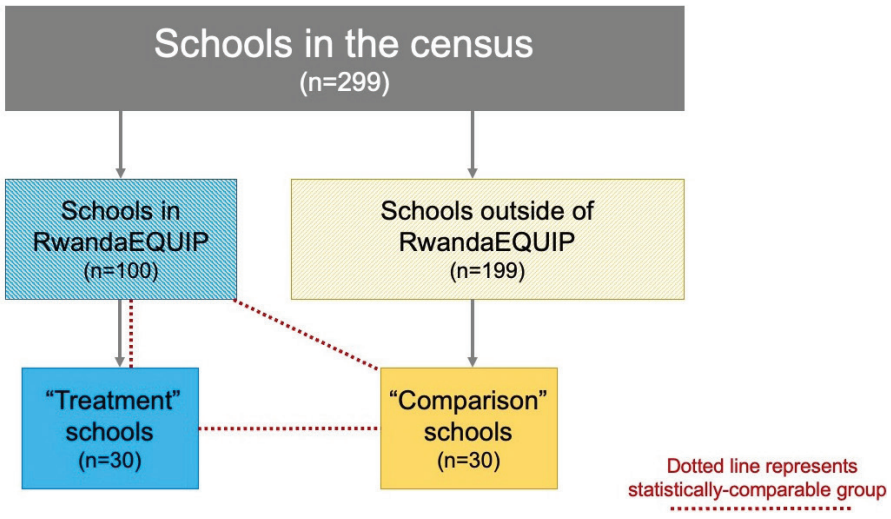


Figure 3.1

To achieve the goal of finding a set of schools that allowed for tracking of the progress of the overall programme, a statistical methodology called "propensity score matching" was used for these Phase 1 schools. This methodology finds pairs of treatment and comparison schools that are most similar to each other before the rollout of the programme. As such, the average performance observed in comparison schools throughout the school year serves as a reliable predictor of what would have occurred in treatment schools had they not participated in the programme (see Table 2 in Appendix C for an in-depth comparison of treatment and comparison school characteristics).

To execute this methodology, the selection process began with a set of 299 schools included in a school census conducted by the programme several months before the first day of class. Based on 27 school-level characteristics, such as pupil counts, number of teachers, and whether early childhood grades are offered at the school, an indicator was created of how likely each school was to be selected into the subset of 100 Phase 1 RwandaEQUIP schools. Then, within each of the five provinces, pairs of schools with similar characteristics were matched, as proxied by their likelihood of being selected into the RwandaEQUIP subset. Each pair had one RwandaEQUIP school and one non-RwandaEQUIP school, both of which were in the same province and shared similar school-level characteristics. From the potential pool of eligible pairs of schools, 30 pairs of schools that were representative of the broader set of 100 schools were selected (see Appendix G for more details on the methodology used). The geographic distribution of the 60 selected schools is displayed below (Figure 3.2):

Geographic Distribution of Schools Included in This Study

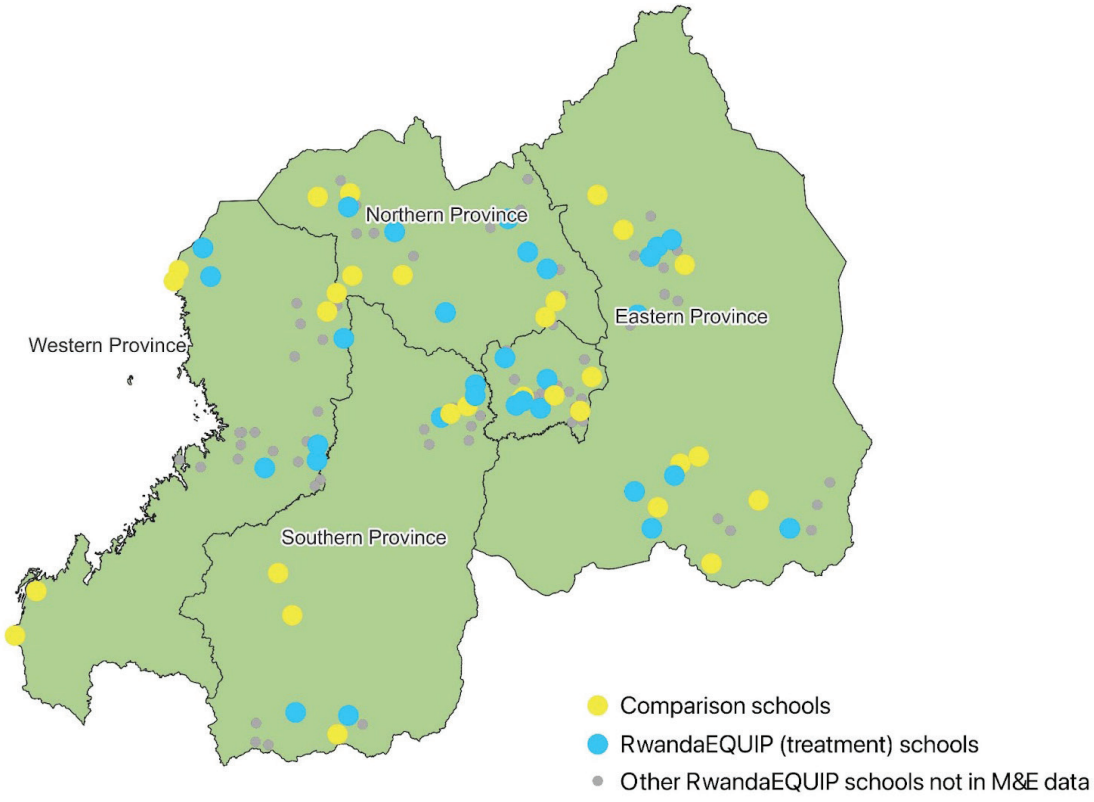


Figure 3.2

Given the anticipated large-scale expansion of RwandaEQUIP over the course of three years, the study also aims to maintain the comparison group from Phase 1 out of the programme for as long as possible such that researchers can make credible inferences of what RwandaEQUIP schools — especially those in Phase 1 — would have looked like had they not joined the programme. In practice, due to the programme's rapid expansion, three schools from the comparison group joined the treatment group in Phase 2 — resulting in a comparison group of 27 schools from the 2022-23 school year onwards.

To effectively monitor learning gains throughout Phases 2 and 3 of the programme, a representative sample of 20 schools per phase is selected annually from the new participating schools, which facilitates the tracking of changes from baseline to endline within these schools as well.[1] Therefore, in Phase 2, an additional 20 schools, reflecting the characteristics of the 150 new RwandaEQUIP schools, are incorporated into the treatment group sample, bringing the total to 50 schools. This selection of additional Phase 2 schools for inclusion into the treatment group employs a proportional stratified random sampling method (stratified at the province-level). Because the "difference-in-differences" method does not require baseline comparability between treatment and comparison schools, the growth in these schools could still be compared to that of the group of comparison schools selected for Phase 1. Finally, as the actual number of pupils joining the programme in each phase is not proportionally represented in the expansion of the treatment group (e.g., 30 schools from Phase 1 drawn from 100 schools, but 20 schools from Phase 2 drawn from 150 schools), the results in this report are weighted by the total number of pupils per phase to ensure representativeness.

Pupils Assessed for This Study

Across the schools that were visited, data were collected from a representative subsample of pupils. Within the 80 total schools, approximately 15 pupils were randomly sampled from each grade — Nursery 3, Primary 1, Primary 2, Primary 3, and Primary 6 — for each assessment. This random selection of pupils ensured that the sample was representative of the overall grade and population of interest at the school. Since these schools are representative of the RwandaEQUIP schools in the respective phases, randomly selecting pupils allowed for a sample that is representative of all pupils in RwandaEQUIP. As the sampling approach for this study consists of "repeated cross sections" of pupils within the same schools, it tracks the same schools over time but not necessarily the same group of pupils within these schools over time. Instead, a new sample of pupils is randomly selected for each round of data collection. Therefore, while each sample of pupils is broadly representative of their respective school and grade, the data shown in this report are not meant to represent individual pupils' progress over time.

[1] "Baseline" refers to the round of data collection that occurred before the programme's implementation. "Endline" refers to the final round of data collection to occur at the conclusion of the 2024-25 school year.

Data Collected

This report documents relevant information on the status of learning outcomes in the country of Rwanda prior to and throughout the implementation of RwandaEQUIP. For the country's programme to be effective — and any educational intervention targeting foundational learning, for that matter — understanding pupils' baseline literacy and numeracy levels is crucial. This information ensures that the programme can meet the needs of all learners through appropriately levelled instructional materials. To obtain a comprehensive view of pupil performance under RwandaEQUIP, the study draws from several assessments measuring literacy, numeracy, and content-knowledge in other areas to assess pupils' oral reading fluency, reading comprehension, and numeracy skills.

Learning assessments used for this study

Early Grade Reading Assessment (EGRA)

The Early Grade Reading Assessment (EGRA) is used to measure the foundational English literacy skills of pupils. More specifically, it measures early reading acquisition by assessing critical skills that early Primary-age pupils (Primary 1-3) need in order to read with understanding. Since its launch in 2006, EGRA has been adapted for use in more than 65 countries around the world in over 100 languages, allowing for accurate comparisons of foundational English literacy outcomes across various contexts (Dubeck & Gove, 2015).

EGRA contains several sub-tasks to measure pupils' literacy skills, and the number of included sub-tasks varies depending on the context and language of the EGRA as it is administered. For this study, Nursery 3, Primary 1, and Primary 2 pupils receive the EGRA, and all pupils are assessed in six sub-tasks: orientation to print, listening comprehension, initial sound identification, phonemic awareness, oral vocabulary, and letter name recognition. Additionally, Primary 1 and 2 pupils are also assessed in familiar word reading, non-familiar word reading (Primary 2 only), oral reading fluency, and reading comprehension. Oral reading fluency — the ability to read quickly, accurately, and with expression — is assessed in correct words per minute (cwpm) using a grade-level passage. In other words, this measure assesses how quickly and accurately a pupil can read a passage aloud in one minute. Reading comprehension — the ability to understand what is being read — is assessed using up to five questions about the same passage used for measuring fluency (see Appendix A for English and Kinyarwanda fluency and comprehension assessments used).

Early Grade Mathematics Assessment (EGMA)

The Early Grade Mathematics Assessment (EGMA) measures pupils' foundational numeracy skills in early Primary grades. Developed shortly after the EGRA, this assessment has been adapted for use in more than 15 countries around the world and serves as a valuable tool for examining how pupils within a country are performing relative to their curriculum. EGMA is administered to pupils in Nursery 3 through Primary 2, and consists of six sub-tasks: number identification, number discrimination, recognition of number patterns, addition, subtraction, and word problems. The specific subskills measured vary somewhat by grade, based on test intention and development levels (see Appendix B for descriptions of the subskills included in the EGMA and EGRA assessments).

Local Early Grade Reading Assessment (LEGRA)

In addition to EGRA, Rwanda's Local Early Grade Reading Assessment (LEGRA) — rigorously developed and utilised in other studies as well (USAID, 2021; Brolley, 2020) — is used to measure foundational literacy skills in Kinyarwanda. Developed jointly by the Rwanda Basic Education Board (REB) and the United States Agency for International Development (USAID), this assessment has been administered to more than 2 million Rwandan pupils in early Primary grades. Therefore, LEGRA is particularly valuable for measuring literacy in a contextually-appropriate manner. For this evaluation, LEGRA is administered to all Primary 1-3 pupils and consists of four literacy sub-tasks: dictation, decoding, recognising letters/sounds, and an oral reading fluency passage with up to five corresponding reading comprehension questions. Although LEGRA was designed to be administered by teachers, this assessment was administered through enumerators.

Primary Leaving Examination (PLE)

Finally, this study relies on the Primary Leaving Examination (PLE) to measure how the learning gains observed in the other instruments translate to gains in a standardised national assessment. This national exam is administered to Primary 6 pupils at the end of the school year, and determines a pupil's eligibility to transition to secondary school. Pupils are assessed according to the five mandatory examinable subjects: Mathematics, English, Kinyarwanda, Social and Religious Studies (SRS), and Science and Elementary Technology (SET). Given the yearly frequency of this exam, the baseline scores for this exam do not come from the period immediately before the rollout of RwandaEQUIP, but rather from the previous school year.

Box 2

The Value of Universal, Early, Conceptual, and Procedural Mastery of Foundational Skills

Over the last few decades, educational enrolment in LMIC has been catching up with the enrolment rates in high-income countries (HIC). However, international standards of literacy and numeracy indicate that the average pupil in LMIC performs worse than 95% of the pupils in HIC (World Bank, 2018) — that is, despite these global enrolment increases, learning levels remain low because children are not mastering foundational skills like literacy and numeracy. For instance, a 2021 study conducted across 32 countries highlighted that on average, only 30% of grade 3 pupils possessed foundational literacy skills, with only 18% possessing foundational numeracy skills (UNICEF, 2022).

Foundational skills are necessary to effectively advance learning, comprehension, and problem solving skills in their future academic careers and personal lives. Lacking foundational skills in the early classes creates even larger gaps in learning in later grades, as pupils who did not master the foundations will have a harder time advancing through higher order concepts. This can have a negative impact on further skill development, career opportunities, and social mobility later in adulthood (Belafi et al., 2020).

To increase overall learning levels, education systems must prioritise universal, early, conceptual, and procedural mastery of foundational skills (Belafi et al., 2020). Universality ensures that learning progress is being made and measured for all children, regardless of socioeconomic status, gender, race or ethnic group, or whether the child is in school. It is also important that foundational skills are mastered in early grades, as learning gaps emerge early and widen throughout grade progression (Belafi et al., 2020). Additionally, developing both conceptual and procedural knowledge helps pupils cultivate a well-rounded understanding of foundational skills, which contributes to mastering the skill and being able to apply it in other contexts (Kilburn, 2020). Implementing all these components in conjunction is necessary for a more comprehensive and equitable approach to teaching and learning.

Prioritising universal, early, conceptual, and procedural mastery of foundational skills may require government intervention, curriculum reform, additional instructional support, and/or targeted remediation efforts for pupils falling behind (Belafi et al., 2020). To successfully implement this, reform should aim to specifically target learning outcomes instead of inputs that may influence learning, such as technology, textbooks, or teachers. For example, in 2015 Tanzania enacted the “3Rs” reform, which consisted of major curriculum reforms in grades 1 and 2 that aimed to focus 80% of instructional time on foundational literacy and numeracy. The reform had a positive effect on both literacy and numeracy; the likelihood of a pupil reaching grade 2 maths proficiency

increased by 50%, and the likelihood of reaching grade 2 Kiswahili proficiency increased by 71% (Rodriguez-Segura & Mbiti, 2022). In this sense, realigning curricular expectations for teachers such that they would focus more heavily on foundational skills led to significant learning gains in the earlier grades, and will allow these pupils to be better prepared to learn new subjects later on.

Insufficient mastery of foundational skills has a detrimental effect on overall levels of learning, thus perpetuating an ineffective education system. To make the system more effective, governments and schools can prioritise universal, early, conceptual, and procedural mastery of foundational skills in schools' curriculum, with the goal to increase learning for a wider range of children. A system-wide commitment to prioritising foundational skills mastery in schools is a necessary step that not only lays the groundwork for future learning, but also effectively bridges nationwide and global equity gaps with more impactful educational investments.

Other data collected for this study

Teaching Practices

To monitor early changes in pedagogical practices after the initial rollout of the programme, the study uses an adapted version of the TEACH observation tool. The TEACH tool was originally developed by the World Bank (2022) for use in classrooms in low- and middle-income countries. The tool is designed to measure teaching practices which are pedagogically sound and empirically proven to be effective. With the TEACH tool, we are able to measure the frequency at which RwandaEQUIP teachers within our sample use these effective practices at the beginning and end of the initial 17 week term (Terms 2 & 3 of the 2021-22 school year) compared to non-RwandaEQUIP teachers. The results from these data serve as leading indicators as to how the quality of teaching changed with the implementation of the programme.

Longitudinal Metrics on Pupil Attendance and Enrolment in RwandaEQUIP Schools

RwandaEQUIP's ecosystem allows the programme team to track metrics on pupil attendance and enrolment in real time. Analysis of these data is completed by comparing average network-wide attendance and enrolment at the beginning of the programme to the same figures observed throughout each school year. This sheds light on whether attendance and enrolment increase over time as the programme matures, and whether improvements in these areas are correlated with learning gains. One major limitation of these metrics is that they are not available for comparison schools, since they are collected using the RwandaEQUIP Education platform.

Teacher Attendance and Lesson Delivery in RwandaEQUIP Schools

Data on teacher attendance and lesson delivery are collected through the teacher tablet used by all RwandaEQUIP teachers. Teachers are required to log their arrival using their tablets prior to their first lesson of the day. If a teacher fails to log their arrival, they are marked as absent. As lessons are provided through the tablet, the rates of lesson completion are tracked as well. Head teachers and school supervisors have access to these data in order to hold teachers accountable and ensure consistent participation in the programme.

Teacher English Language Proficiency

Finally, data are collected from all schools on teachers' English proficiency levels to help inform specialisation assignments and assess their ability to engage with written lesson plans. One can hypothesise that teachers' English language proficiency might moderate the extent to which they are able to engage with instructional materials in English, and therefore, any instructional material prepared for these teachers must be tailored to their proficiency levels. Therefore, to understand teachers' capacity to effectively teach and communicate with pupils in English, teachers in the sampled schools are assessed on their English oral reading fluency, listening, and speaking skills. Teachers' oral reading fluency is assessed in a similar way to how pupils' reading fluency is quantified — by measuring the number of correct words read in one minute (using a more complex passage). To assess their oral comprehension and speaking skills, teachers are given a series of prompts that they must listen and respond to.

Evaluating the Impact of the Programme

The empirical strategy for measuring learning growth in RwandaEQUIP

A key component of RwandaEQUIP is the systematic monitoring of the gains achieved across educational outcomes and the identification of areas that require further attention. Doing so allows programme leaders to understand how the programme has impacted learning growth thus far, highlight the milestones that have been reached since the programme's launch, as well as determine appropriate directions for continued improvement in the future. Therefore, the impact of the programme is measured using a statistical methodology called **"difference-in-differences"**.[2] For more information on the difference-in-differences method, see Box 3.

The difference-in-differences technique can be utilised as long as there are comparable data for treatment and comparison schools; therefore, the difference-in-differences technique was used at the end of the 2021-22 school year for Phase 1 treatment and comparison schools, as well as at the end of the 2022-23 school year, for the same group of Phase 1 schools and also for Phase 2 treatment and comparison schools, allowing us to benchmark outcomes from multiple points in time throughout the programme. It is important to note that by the end of the 2022-23 school year, approximately 10-13% of all enrolled pupils in Phase 1 schools in Primary 2 — those who would have been in Primary 1 during the 2021-22 school year — had not participated in RwandaEQUIP during its first 17 weeks of implementation. Thus, these new pupils likely received a lower dosage of instruction compared to those in the same grade who joined the programme when it commenced, potentially underestimating the programme's effect on learning in Phase 1 schools.

[2] Specifically, a "matched" difference-in-differences set up is used, where the comparison group was selected before the collection of baseline scores based on its similarity (as quantified by the propensity score matching process) to the RwandaEQUIP schools.

Box 3

The "Difference-in-Differences" Method

To understand the impact of a programme, the gains observed among participants of the programme must be compared to the gains that would have been observed for the same participants over the same period of time in the absence of the programme. Comparing the learning levels at RwandaEQUIP ("treatment") schools and non-RwandaEQUIP ("comparison") schools at a single point in time would not allow meaningful interpretation, as this could mask differences between the groups that would have existed regardless of their participation in the programme. Similarly, following the changes in the learning levels at RwandaEQUIP schools over time, without reference to what these changes would have looked like without the programme, would not yield meaningful conclusions about the impact of the programme. Therefore, impact is calculated using a statistical methodology called "difference-in-differences".

The difference-in-differences method relies on two rounds of data collection: one before the start of an intervention (such as the rollout of RwandaEQUIP), and one at the end of an instructional period (such as a school year), for both treatment and comparison schools. Using these data, a status-quo growth trajectory can be established based on how comparison schools progressed over the course of the instructional period; in other words, the first "difference" calculated is the difference between end-of-period and start-of-period learning levels at comparison schools. This growth trajectory at comparison schools serves as a reference for how current RwandaEQUIP schools would have progressed had they not taken part in the programme, and it is added to the start-of-period learning level at treatment schools to calculate the expected learning level at the end of the instructional period. Then, the actual learning level at the end of the instructional period is compared to the expected learning level; i.e., the difference in differences is calculated, yielding a quantitative measure of the "RwandaEQUIP effect" — the amount of growth beyond expected levels made by RwandaEQUIP pupils. The full analytical setup of the study is illustrated with a graphic at the bottom (Figure 3.3).

Analysing the "RwandaEQUIP Effect" Using a Difference-in-Differences Approach

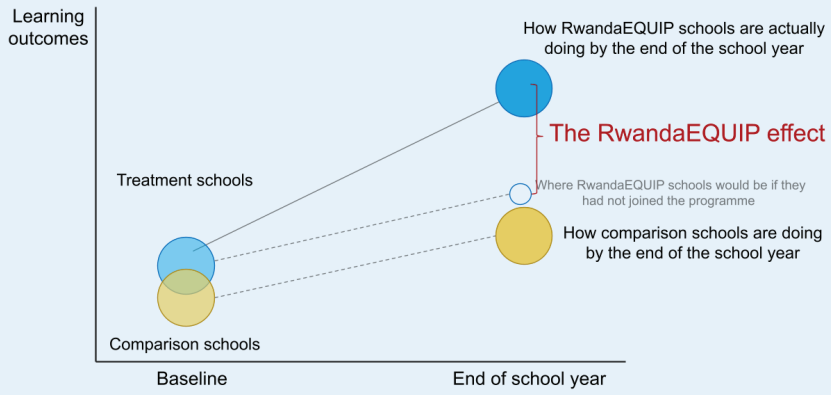
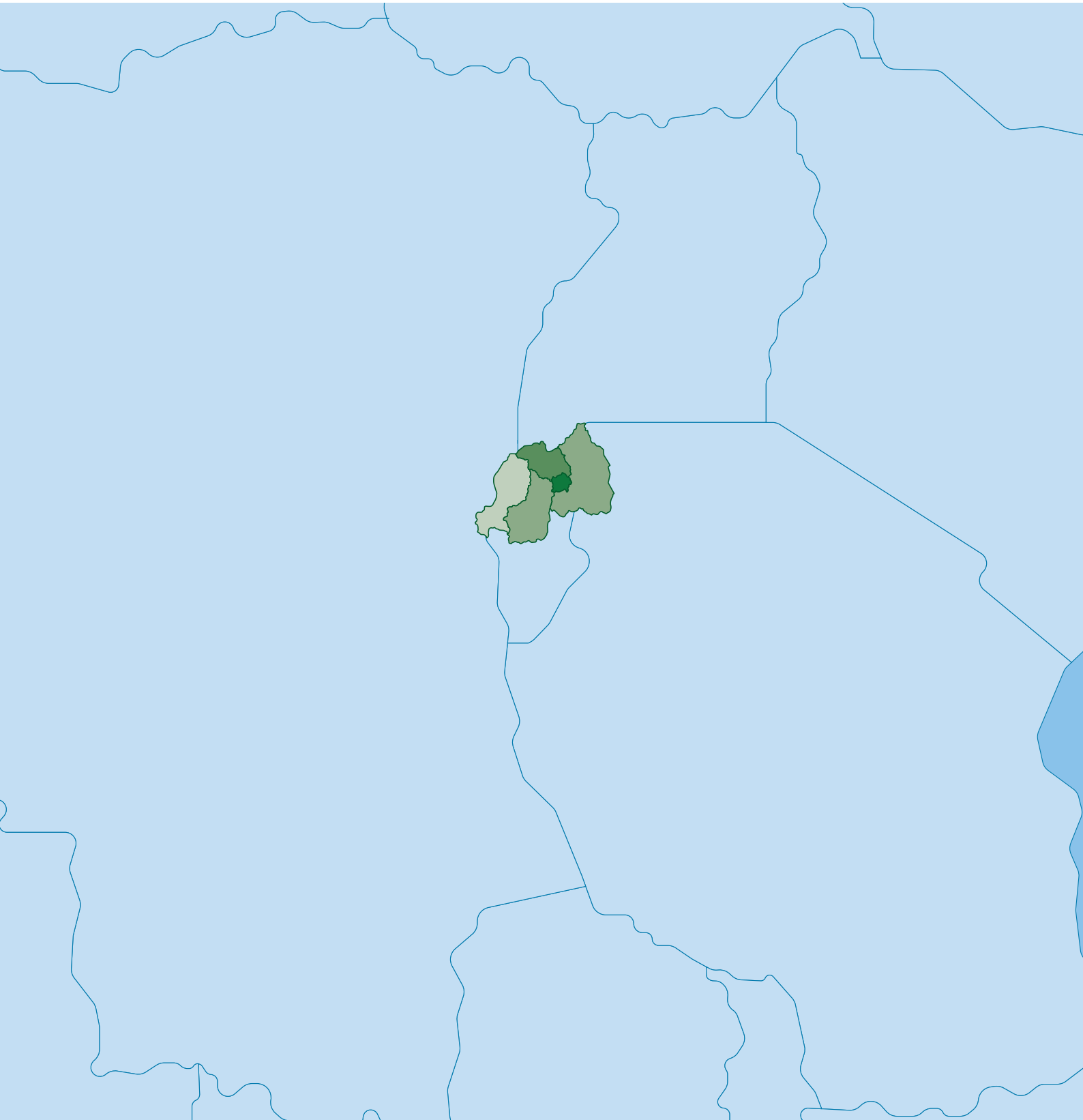


Figure 3.3

Complementing quantitative results with a qualitative study

To complement the quantitative results from Phase 1, this study also conducted a qualitative follow-up in August 2022, after the conclusion of the 2021-22 school year. This follow-up was conducted to better understand the mechanisms behind some of the observed quantitative results from the first 17 weeks. In-depth interviews with teachers and head teachers were conducted in eight Phase 1 schools. These interviews touched upon topics of stakeholder satisfaction with the programme, parental and pupil engagement, and areas for improvement, among others. These interviews followed a structured protocol (outlined in Appendix I) and the results were subsequently analysed using conventional coding practices for qualitative data.

IV. The State of Learning in Rwanda Before the Start of the Programme



Average foundational literacy levels were low across all grades

Data collected before the programme's launch revealed that the majority of Rwandan pupils in early grades — Nursery through Primary 3 — had very weak foundational literacy skills. For example, more than 9 in 10 pupils in a typical Primary 1 class could not read a single word in English at the start of the second term of the school year (Figure 4.1).

Share of Pupils Who Are Non-readers in English

In Rwanda before RwandaEQUIP, start of Term 2

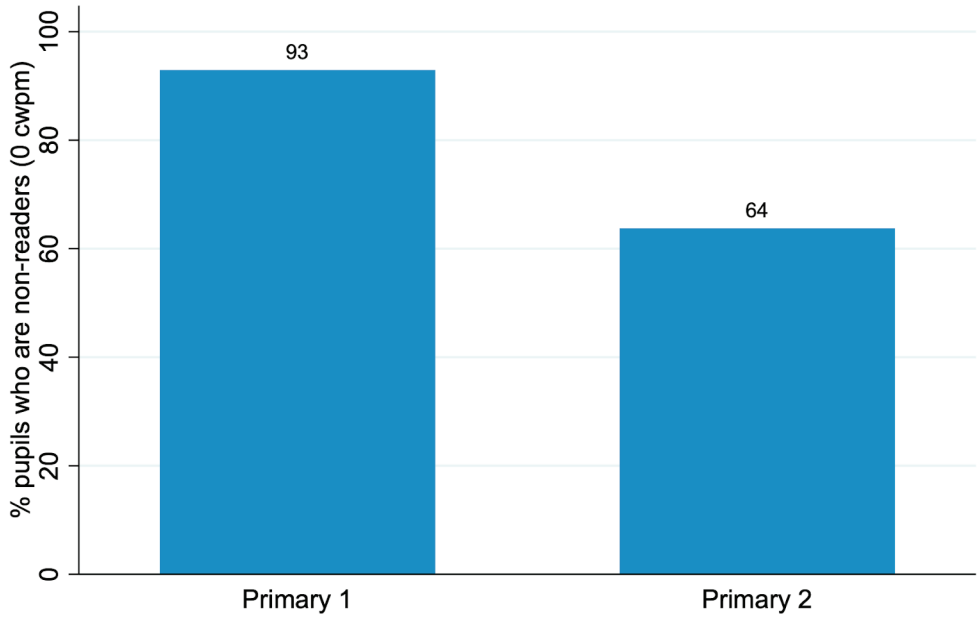


Figure 4.1

Further, more than half of all pupils in Primary 1 could not read a single word in Kinyarwanda at the beginning of Term 2 (Figure 4.2). In a typical Primary 2 classroom, one-fifth of all pupils were non-readers in Kinyarwanda, and over 60% were unable to read in English by Term 2. For context, developers of LEGRA define "meet expectations" as reading at least 7 correct Kinyarwandan words per minute in Primary 1, and at least 20 correct words per minute in Primary 2 by the second term of the school year. In Rwandan government schools, less than one third of pupils were meeting these relatively low thresholds.

Share of Pupils Who Are Non-readers in Kinyarwanda

In Rwanda before RwandaEQUIP, start of Term 2

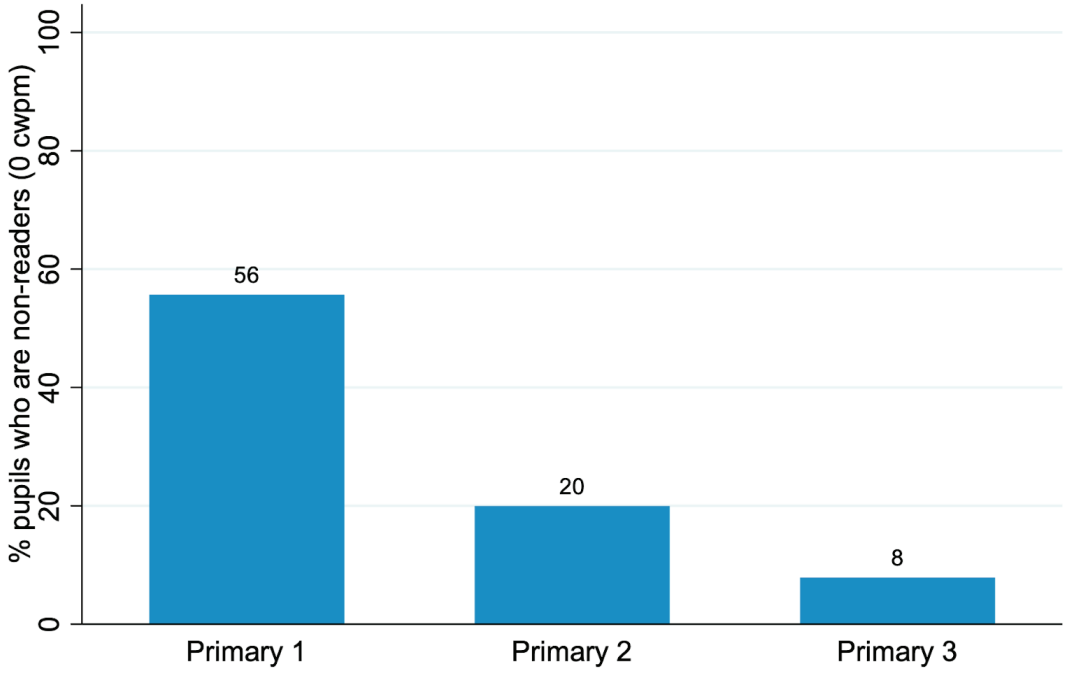


Figure 4.2

A lack of foundational knowledge posed challenges for pupils when engaging with more advanced literacy skills, such as reading comprehension

The low levels of reading fluency displayed by pupils posed a significant challenge in their ability to understand and effectively engage with grade-level written material. For instance, by Primary 3, only half of pupils met grade-level expectations for reading comprehension in Kinyarwanda. Low learning levels were even more pervasive in English comprehension — virtually no Primary 1 or 2 pupil met expectations for reading comprehension in English (see Figures 1-2 in Appendix D). This issue was particularly worrying, as reading comprehension is often considered the "ultimate goal" of literacy in itself due to its critical role as the bridge to learning higher-order concepts in other areas, both in school and beyond.

Most pupils could not solve maths problems using age-appropriate subskills

In numeracy, the situation was similarly bleak; the average Primary 1 pupil could perform fewer than 3 simple addition problems taking a form similar to "4+5" in one minute. By the time pupils reached Primary 2, the average pupil answered only 5 problems correctly in one minute — taking 12 full seconds on average to answer this type of question. Similar to the reading fluency outcomes described above, external benchmarks can be applied to these scores to understand what proportion of pupils are developmentally behind where they are expected to be (RTI International, 2014). In particular, these benchmarks indicate that pupils in Primary 1 should be solving 8 of these simple addition problems in one minute, and by Primary 2, they should be solving 12 of these problems. At the start of the programme, fewer than 10% of all Primary 1 pupils and fewer than 5% of all Primary 2 pupils were meeting these standards. A majority of pupils were nowhere near even half of the threshold to reach a developmentally appropriate level of foundational numeracy competency, using basic addition problems as a proxy (Figure 4.3).

Single-Digit Addition Problems, Per Minute

In Rwanda before RwandaEQUIP, start of Term 2

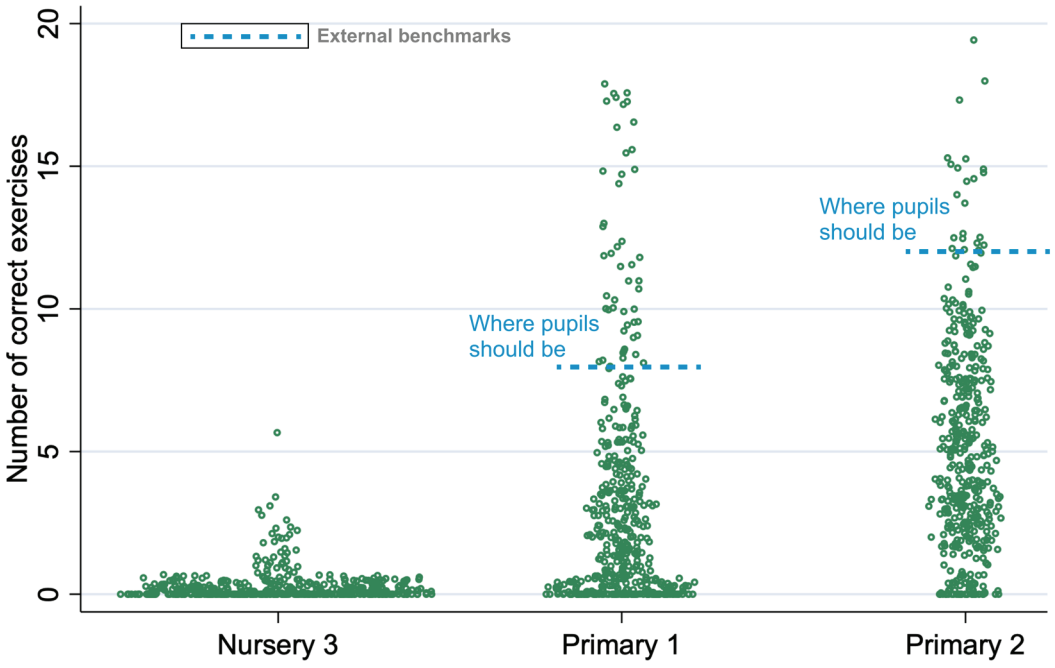
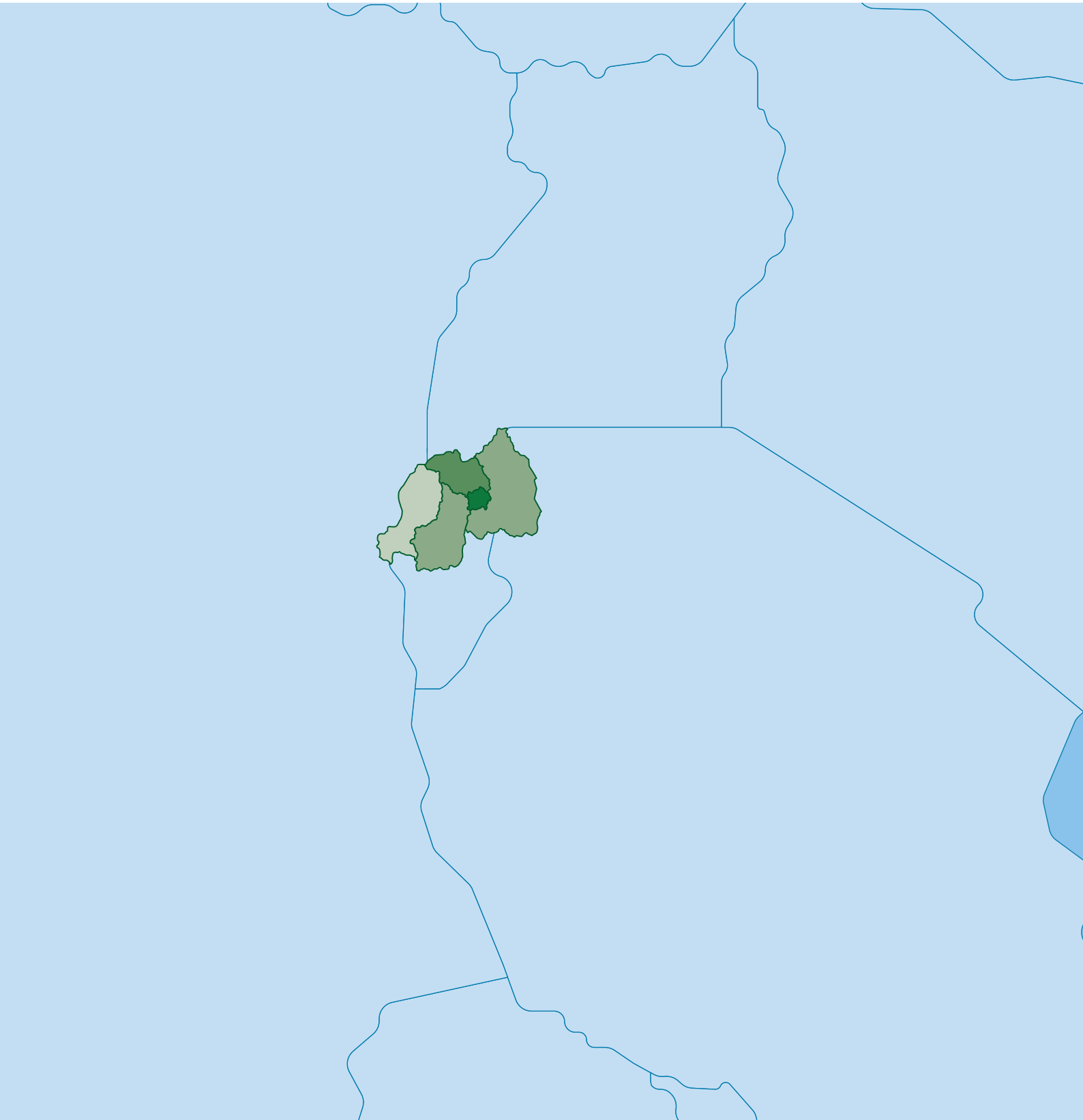


Figure 4.3

V. Indicators of Progress After 17 Weeks of Programme Implementation



Early Improvements in Foundational Skill Development

During its first 17 weeks of operation, RwandaEQUIP quickly produced very large gains in foundational English outcomes. The figure below (Figure 5.1) demonstrates the improvement trajectory for the EGRA assessment.[3] The yellow dotted line depicts how, in the absence of the programme, RwandaEQUIP pupils would likely have progressed on a similar trajectory to those in comparison schools. RwandaEQUIP pupils' actual performance, depicted by the blue line, quickly surpassed their expected learning outcomes. Overall, RwandaEQUIP pupils' proficiency on the EGRA improved by 18 percentage points more than it would have absent the programme — improving at a rate 64% faster than pupils in comparison schools.

Improvement in EGRA Proficiency in RwandaEQUIP Schools in Year 1

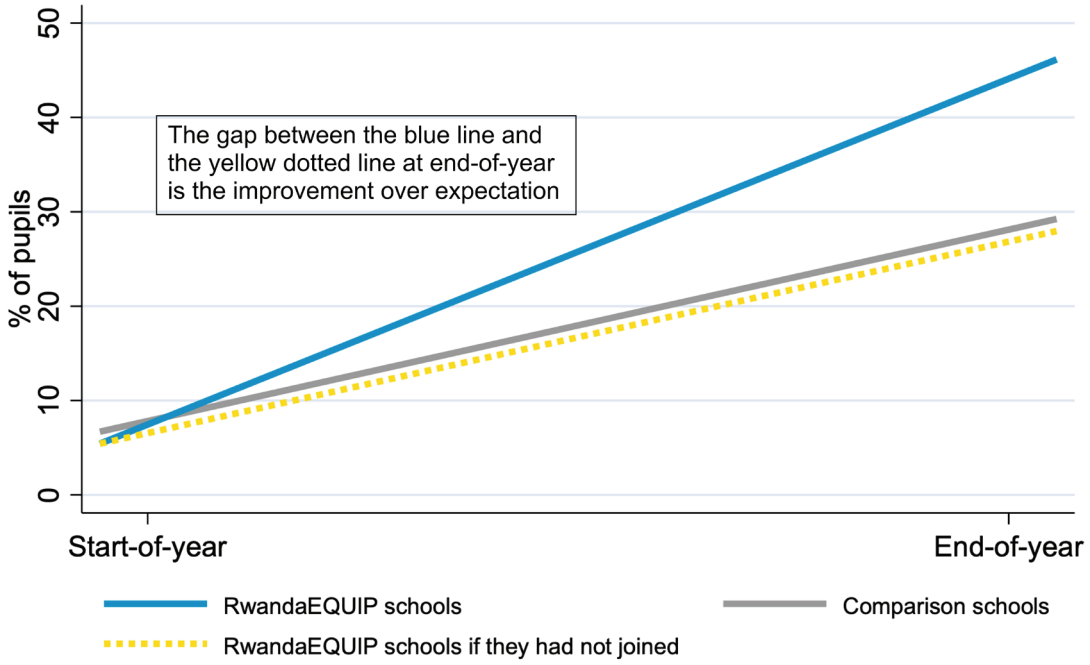


Figure 5.1

[3] "Proficiency" is measured using thresholds agreed upon by the RwandaEQUIP and NESA teams in the initial Measurement and Evaluation Plan. For EGRA, a pupil is classified as proficient in English in their respective grades if they score: P1: at or above 5 cwpm, and at 60% or higher on reading comprehension, P2: at or above 12.5 cwpm and at 60% or higher on reading comprehension, P3: at or above 20 cwpm and at 80% or higher on reading comprehension. For pre-Primary, proficiency was defined as at or above 33.3% on oral vocabulary.

The positive effects of the programme were visible across all English literacy subskills. For example, pupils in a typical Primary 1-2 classroom in RwandaEQUIP and comparison schools were able to read approximately 1-2 cwpm in English at the start of the programme. By the end of the first school year, after 17 weeks of implementation, the average RwandaEQUIP pupil in Primary 1-2 improved their reading fluency by an average of 10 cwpm, compared to a 5 cwpm improvement for comparison pupils (Figure 5.2). **This treatment effect, 5 cwpm in only 17 weeks, demonstrates an improvement in RwandaEQUIP pupils' fluency that is 70% greater than pupils in comparison schools** (see Table 3 in Appendix C).

Learning Gains in Reading Fluency Within 17 Weeks

Kinyarwanda and English

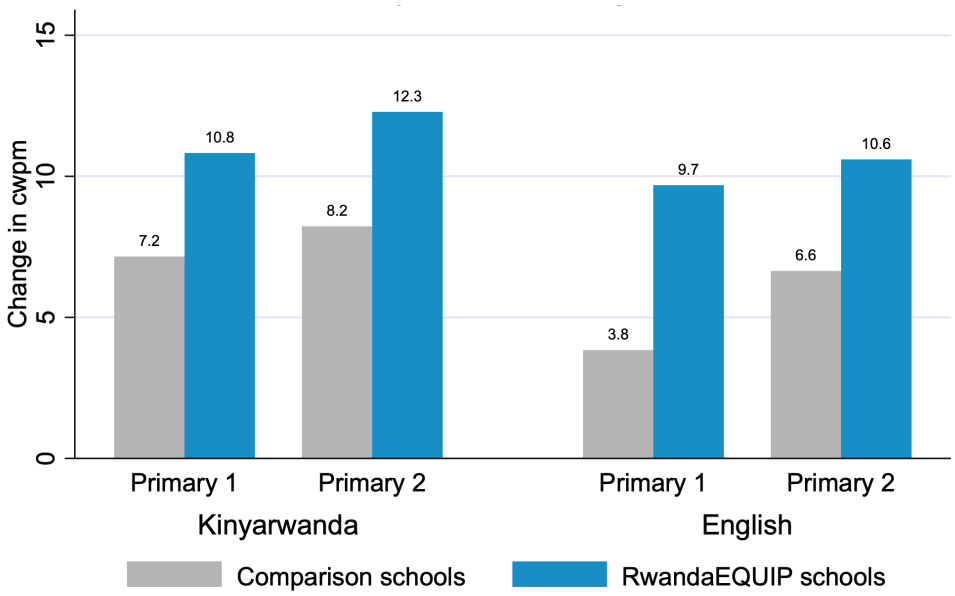


Figure 5.2

Importantly, the observed gains in English did not come at the expense of progress in Kinyarwanda, even though English was the primary language of instruction in RwandaEQUIP schools. In RwandaEQUIP schools, the growth rate in Kinyarwanda fluency was twice that of pupils in comparison schools, with pupils in a typical Primary 1-3 class in RwandaEQUIP schools reading 9 more words per minute than their peers in comparison schools (see Table 4 in Appendix C). Pupils in a typical Primary 3 classroom displayed the largest growth in Kinyarwanda fluency, reading 20 more correct words per minute than their peers in comparison schools.[4] The gains in fluency translated into large gains in reading comprehension as well. Despite RwandaEQUIP schools initially having lower average Kinyarwanda reading comprehension scores compared to non-RwandaEQUIP schools, pupils in RwandaEQUIP schools outperformed their counterparts across all grades. **For example, pupils in a typical Primary 2 class improved their Kinyarwanda comprehension scores at twice the rate of those in non-RwandaEQUIP schools,** increasing by an average of 29 percentage points, compared to a 13 percentage point increase in non-RwandaEQUIP schools (Figure 5.3).

[4] Because Primary 3 pupils were not assessed in English, Figures 5.2 and 5.3 do not display Kinyarwanda Primary 3 outcomes. To see full details regarding LEGRA outcomes for all grades, refer to Table 4 in Appendix C.

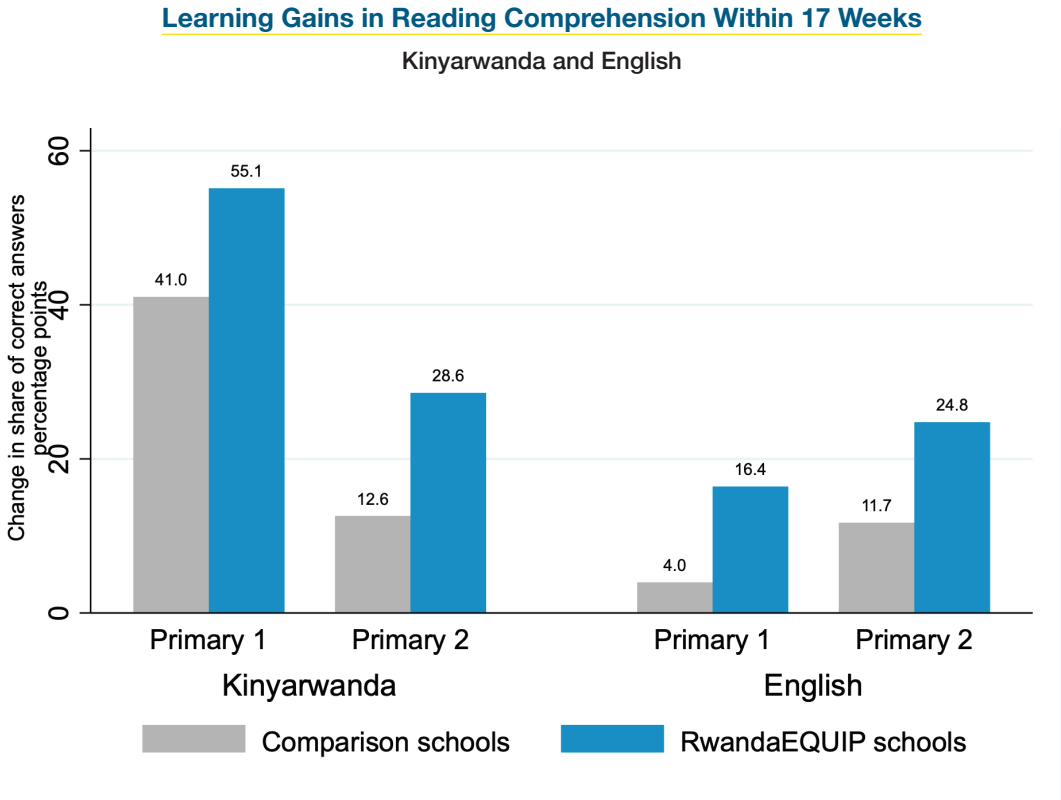


Figure 5.3

> "When using the method students can easily understand and follow up, especially with Kinyarwanda."

–Nizeyimana Jean De Dieu, G.S. Muhondo, Kinyarwanda & Social Sciences Teacher

There were similarly large effects in maths. Similarly to Figure 5.1, the figure below (Figure 5.4) demonstrates RwandaEQUIP pupils' improvement trajectory on EGMA. As shown, RwandaEQUIP pupils' EGMA proficiency substantially improved after 17 weeks, quickly surpassing their peers in comparison schools.[5] On average, RwandaEQUIP pupils' EGMA proficiency improved by 10 percentage points more than pupils in comparison schools, **amounting to nearly a five-fold acceleration in the pace of learning maths in just 17 instructional weeks** (Figure 5.4). The effects of the programme were equally significant in more concrete subskills; for instance, pupils in a typical Primary 1 class in RwandaEQUIP schools outperformed pupils in a typical Primary 2 class in comparison schools in solving single-digit addition and subtraction problems. Meanwhile, RwandaEQUIP pupils in a typical Primary 2 class had large gains in more complex skills, improving by 9 percentage points in multiplication and 12 percentage points in division (see Table 5 in Appendix C).

Improvement in EGMA Proficiency in RwandaEQUIP Schools in Year 1

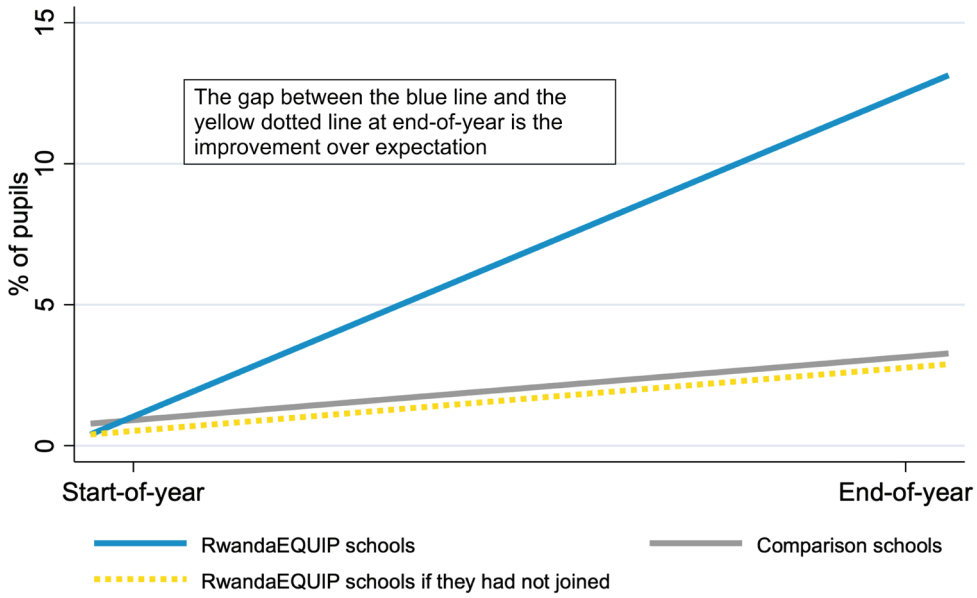


Figure 5.4

RwandaEQUIP had a larger effect on learning than the majority of education interventions in similar contexts

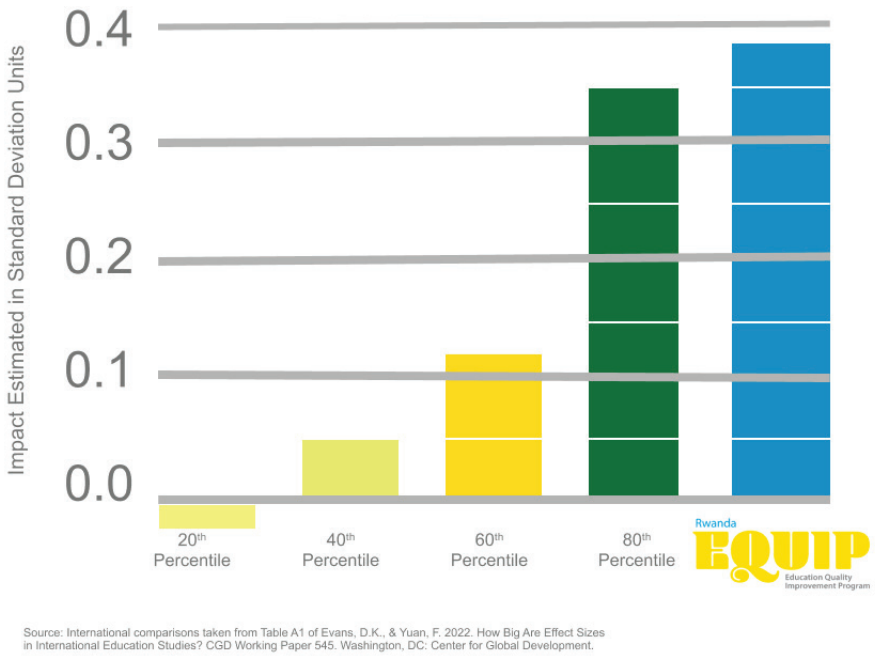
To understand the magnitude of the learning gains achieved in Phase 1 of RwandaEQUIP, the observed gains in foundational literacy and numeracy in RwandaEQUIP schools can be compared to the gains achieved in other programmes in similar contexts. To do so, learning impacts were translated into "standard deviation" units (SD), which allows for the comparison of relative effect sizes across programmes. Within each of the three main assessments — LEGRA, EGMA, and EGRA — the measured subskills and their outcomes were aggregated in order to determine the programme's average effect on foundational literacy and numeracy outcomes. As Appendix Tables 3-5 show,

[5] For EGMA, proficiency was defined as pre-Primary: 50% on number identification, and 50% on number discrimination. P1: 60% on both addition and subtraction exercises, level 1 as defined in the assessments. P2: 60% on both addition and subtraction exercises, level 2 as defined in the assessments.

the aggregate effect size for LEGRA was 0.33 SD, and for both EGRA and EGMA it was 0.39 SD. Therefore, the average effect of the programme on foundational literacy and numeracy was 0.38 SD after 17 weeks.

The effect of RwandaEQUIP was then compared to the effects of more than 230 experimental and quasi-experimental education interventions studied in low- and middle-income countries (LMIC). Among other studies with similar methodologies that evaluated educational interventions in LMIC, the average effect size was 0.08 SD (Evans & Fei, 2022). Therefore, the effect of RwandaEQUIP was more than four times the median effect size across more than 230 international education studies. **In fact, the impact of RwandaEQUIP was larger than 90% of all 230+ studies compared by Evans and Fei (2022) — a feat achieved only during the first 17 weeks of programme implementation** (Figure 5.5).

Comparison of RwandaEQUIP Effectiveness to Other Studies Around the World



Source: International comparisons taken from Table A1 of Evans, D.K., & Yuan, F. 2022. How Big Are Effect Sizes in International Education Studies? CGD Working Paper 545. Washington, DC: Center for Global Development.

Figure 5.5

Rapid Improvements in Teacher Practices

In just 17 weeks, teacher performance improved on at least two fronts. First, teacher attendance increased and teacher tardiness was reduced.[6] During the first three weeks of the programme, teacher attendance was 66%. By the last three weeks of the 2021-22 school year (weeks 15-17 of the programme), teacher attendance had increased to 83% — a 17 percentage point increase. **In short, the teacher absenteeism rate was cut in half (from 34% to 17%) after 17 weeks.**

> "This has been helpful, it was hard for me before to keep track of teachers. But, this technology has helped, teachers are no longer late."
>
> – Ntindendereza Jeanine, G.S. Gakiri, Head Teacher

Teachers also demonstrated improvements in their pedagogical practices, creating more effective and engaging classroom environments. Classroom observations, conducted using an adapted version of the TEACH tool, were utilised to assess the extent to which teachers were implementing desirable instructional practices in treatment and comparison schools. Meaningful improvements were observed across a wide range of skills and practices in the classroom, including areas such as monitoring pupils' learning progress, encouraging perseverance, providing a supportive learning environment, providing feedback to pupils, and facilitating lessons (Figure 5.6). As a result, the implementation of improved instructional practices yielded significant advancements in the quality of education provided in contrast to comparison schools, demonstrating positive transformations in the learning environment within RwandaEQUIP schools (see Table 6 in Appendix C).

[6] Teacher presence is measured through the technological platform using arrival times. When teachers do not have an arrival time, they are marked as absent. Initially, slow adoption of the technology may have led to more teachers being marked absent due to the lack of an arrival time, not actual absence. To minimise the concerns that this might be driving this increase in perceived teacher attendance, we conduct different robustness checks. First, we varied the "baseline period" to allow for more time to adopt the technology. Second, we only considered absences that were actively marked by head teachers — even if more head teachers used this functionality over time, the initial value likely underestimates the actual increase, reinforcing the indication of substantial improvement in teacher presence. Third, additional qualitative data suggests that head teachers have indeed noticed an improvement in teacher attendance. In sum, there is a high degree of confidence in the fact that RwandaEQUIP led to a large increase in teacher attendance, and amount of high-quality instructional time received by pupils.

Difference in Teacher Practices Between RwandaEQUIP and Comparison Schools at Midline

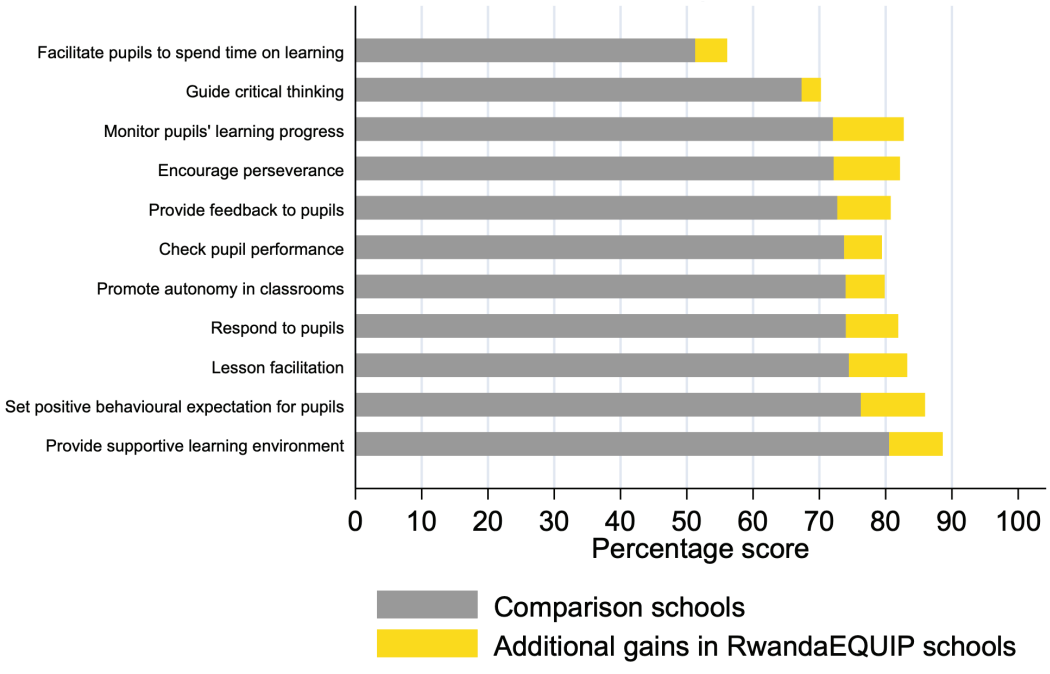


Figure 5.6

Box 4

School Leaders Matter: A Conversation with Theoneste Benimana from G.S. Bumba

When the RwandaEQUIP team got to G.S. Bumba at around 3:50 pm, the head teacher of the school — Mr. Theoneste Benimana — was diligently working on logistical preparations ahead of the upcoming school year. That day, he needed to enter final marks into his digital records to decide grade-level promotions for all pupils in the school. This was a welcome sight, as we got to Bumba one or two hours after first visiting another school in the area, where the head teacher was nowhere to be found in spite of repeated notices of an upcoming visit, and attempts to reach them after arriving at their school. We never heard back from that first head teacher.

The purpose of our visit was to understand what was making RwandaEQUIP "click" so well in some schools, and why its full implementation was harder in other schools. Therefore, while the numbers and learning assessments in this report can inform how much pupils have improved, they are limited in what they can say about how these improvements came to be. The mere reporting of large increases in English reading fluency, for example, cannot speak to the drive and hard work put in by all those head teachers working tirelessly to make the programme a success in transforming learning outcomes in the country. Therefore, in order to get more insights about how school leaders can shape the success of the programme, pairs of RwandaEQUIP schools were identified in the same area with some of the largest and smallest gains in learning outcomes. Following the selection of schools, head teachers participated in conversations with the programme team. Through these conversations, the goal was to understand what it is that they are doing right as they implement the programme, what challenges are holding RwandaEQUIP back from achieving even larger gains, and what feedback they had to keep fine-tuning the programme.

Right around 4:00 pm, we sat down with Mr. Benimana, who promptly took out a notepad with an extensive list of issues he wanted to discuss, in his office. It was clear that he had given this conversation some forethought — and he had the notes to show for it. As the conversation went on, it was also clear that he was tightly in-sync with the programme and what was happening in his school. The deeper we went into his agenda, the more specific the programmatic details that he wanted to discuss: how the change in the language of instruction happened in the classroom, the technical issues that have gone smoothly and those that have not, and the amount of time that pupils get to practise relative to the overall length of the lectures, among other topics.

To Mr. Benimana, it is apparent that pupils are learning more and are more proficient in English than before: “We have improved the language of instruction. Before we used to teach English but still had to use Kinyarwanda to explain. Now, there’s no need for that, as everything is on the [teacher guide]. Today, we use English only, and learners answer in English only.” The pattern that Mr. Benimana describes is evident in the data too. The average Primary 1–2 pupil in schools in the Northern province — including Bumba — was reading fewer than 2 correct words per minute in February. By the end of the school year, pupils in Bumba were able to read almost 18 correct words per minute — beating by over 8 words (80%) the progress observed in comparison schools.

Importantly, in Bumba — as is seen in most other schools — these gains did not crowd out gains in Kinyarwanda, an issue that is often top-of-mind for many parents. As another head teacher in the Northern province said, “The programme is good, especially for teaching English, and parents like it too, but some showed concerns that we are no longer teaching Kinyarwanda properly, since now everything is in English. This is because pupils go home reciting cheers and songs [in English] that they learn here.” Yet, the average P1–P3 pupil in Bumba went from scoring a 26% on a reading comprehension test in Kinyarwanda before the programme to scoring 80% at the end of the school year. This is 20 percentage points higher than what pupils in comparison schools achieved, who finished, on average, with a score of 60%. Through RwandaEQUIP, pupils are simultaneously developing stronger literacy skills in both English and Kinyarwanda, relative to pupils in schools outside of the programme.

Mr. Benimana was also keen to highlight that the programme has lightened the more transactional work for teachers, while maximising the time they actually spent engaged in instruction. “Lesson planning is easy for them. Before, we used to write notes with pens on paper before the class, but today, that is not needed. Today, they just use the tablets, and that improves the quality of instruction very much.” This is important, especially in light of the recent Learning Achievement in Rwandan Schools Report by NESA, in which one of the key policy recommendations was to review the workload of teachers, as “teachers urged that pupils’ performance is low because they do not have time to prepare lessons.” By relieving teachers from the duties associated with lesson planning and exam preparation, RwandaEQUIP ensures that teachers spend more time engaging in high-quality instruction.

But, Mr. Benimana’s long list of issues to discuss was not a cheerleading exercise either. He made sure to also bring up areas that, in his eyes, needed improvement or reconsideration. The most pressing piece of feedback on his agenda was to nudge the programme to use co-teachers' time more wisely. He strongly felt that they were a valuable resource — almost a luxury — which could be better deployed to drive stronger learning gains.

According to Mr. Benimana, the success of the programme at Bumba did not come instantly: it took some time and perseverance for teachers to accept the programme and use it widely. For example, at first, teachers struggled with the teacher tablets. So, as the head teacher, Mr. Benimana pitched in as the impromptu, first line of troubleshooting support and helped teachers get set up with the tablets. “Today, nobody comes here to ask for assistance with their tablet.” This increased buy-in into the programme shows up in the data too. The rate at which teachers in Bumba completed their lessons went from 11% during the first four weeks of the programme to 86% during the last four weeks of the 2021-22 school year.

Towards the end of the interview, we revealed to Mr. Benimana why we specifically wanted to visit Bumba — in particular, the impressive implementation of the programme in this school, and the large learning gains that followed. “That performance is all due to the teachers. We have committed teachers in this school. Even if I helped them, they always do what they are supposed to do, without supervision.” Strong school leadership, as Mr. Benimana shows, is open-minded, humble, collaborative, devoted, and pursuant of what is best for pupils’ future — especially if this comes in the form of a whole-school transformation, called RwandaEQUIP.

The programme worked for a diverse set of schools with a wide range of English proficiency levels

A key pillar of RwandaEQUIP is the distribution of high-quality, structured teacher guides to ensure high-quality instruction. These guides support teachers in a range of activities, including explaining new concepts, offering appropriate examples, assessing for mastery, providing practice activities, reinforcing past concepts, and helping to scaffold and pace lessons. While teachers do require a baseline level of English language proficiency in order to effectively deliver these guides, one outstanding question was whether teachers with higher English proficiency levels benefited more from these guides, as measured by learning gains in their classrooms.

Before the start of the programme, data were collected from all schools on their teachers' English fluency and oral language skills. Since the data collection happened during the 2021-22 school year before the initial rollout of the programme, there is no available link between each individual teacher and their class — as pupils are likely to have had at least two different teachers during this period. Therefore, school-level averages of teachers' English fluency were created and analysed instead.

Using this data, no evidence was found to suggest that a teacher's level of English fluency impacted the effectiveness of RwandaEQUIP in its first 17 weeks of implementation. Put differently, when supported with high-quality instructional materials in the form of structured teacher guides, teachers with lower levels of English proficiency were able to deliver gains that were as large as gains delivered by teachers with higher levels of English proficiency. This is a critical insight, given that pupil English proficiency levels were quite low on average at the start of the programme. RwandaEQUIP's ability to achieve equitable outcomes regardless of teachers' English language proficiency underscores the critical role that a supportive instructional environment can have on learning outcomes, especially within a broader shift in language of instruction.

Relationship Between Teacher Fluency And Programme Effects on Single-Digit Addition

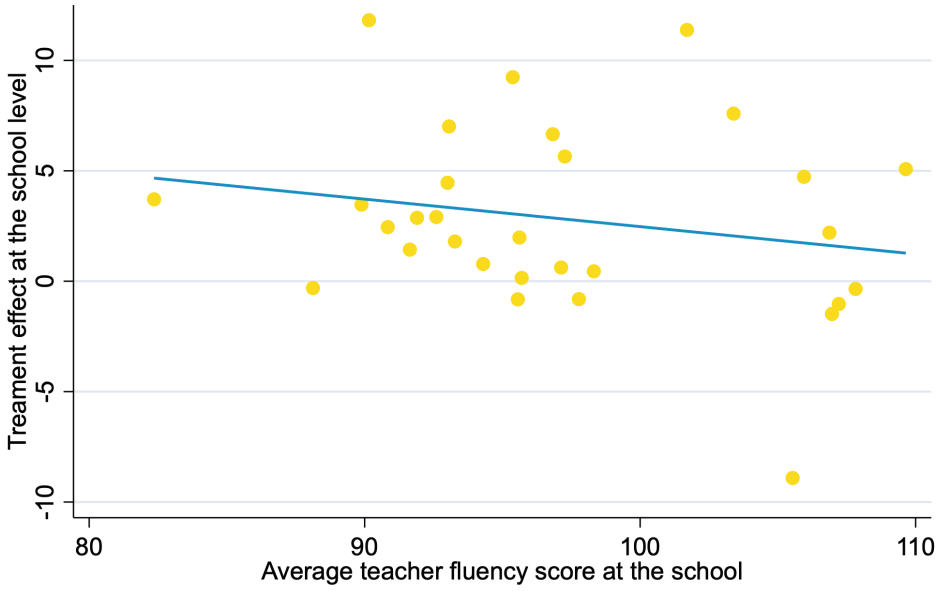


Figure 5.7

Relationship Between Teacher Fluency And Programme Effects on English Reading Comprehension

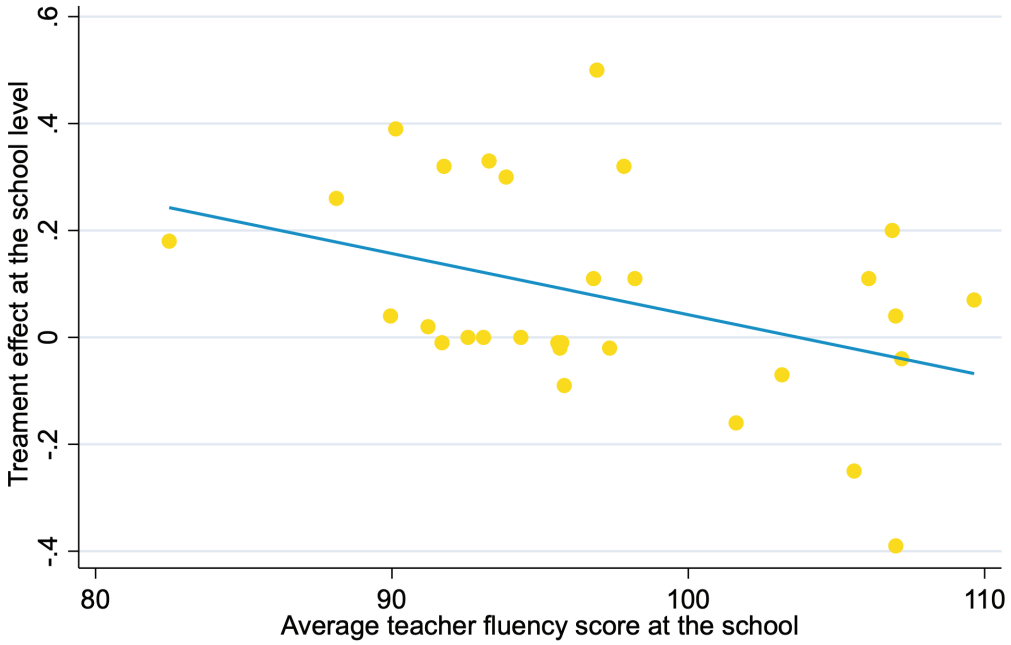


Figure 5.8

Further, most teachers across treatment and comparison schools already possessed relatively high levels of English fluency, with very few differences between the groups. For instance, at the start of the programme, teachers in RwandaEQUIP schools could read 98 cwpm on average, and those in comparison schools could read an average of 97 cwpm. Even those in schools that comprised the bottom 10% of the score distribution could read an average of 85 cwpm in English. Moreover, the vast majority of teachers — 92% in treatment schools and 90% in comparison schools — could read above the minimum fluency threshold (45-60 cwpm) identified by researchers as necessary for reading with some degree of comprehension (Abadzi, 2012). Very few teachers had fluency levels below this threshold; only 2% of all teachers, roughly 1% in treatment schools and less than 3% in comparison schools, could read less than 45 cwpm. Therefore, these findings were highly encouraging as they shed light on the broader potential effectiveness of the programme in other schools within Rwanda, especially those with limited educational resources.

Programmatic Considerations for Phase 2 and Beyond

A core component of RwandaEQUIP is the continuous assessment and evaluation of the effectiveness of the programme and its component parts. This process informs decision-making regarding strategic adaptations to the programme, with the goal to optimise the programme's long-term effectiveness and maximise its impact on learning. Therefore, in addition to presenting findings on the overall effectiveness of the programme during its first 17 weeks of operation, the current report also aims to highlight relevant trends in the data and speak to some of the programmatic and policy design considerations that arose from the findings. The results from the first 17 weeks

of RwandaEQUIP were highly encouraging and provided many positive indicators of the results to come in future years. Nonetheless, the data revealed several programmatic areas that required further adaptation and/or improvement. These areas are outlined below, along with the strategic decisions that were made as the programme moved into Phase 2.

Differences in programme implementation impacted the extent of the gains observed across regions and grades

After 17 weeks, there was significant variation in the extent of programme implementation across the different provinces and grade levels, and thus, differences in the size of the initial gains in learning outcomes. For instance, the programme had significantly larger effects in the Southern and Northern provinces, relative to other provinces, such as Kigali (see Table 7 in Appendix C). Further, while lesson completion increased over time in every province, Kigali lagged significantly behind all other provinces in the rate of progress throughout the school year (Figure 5.9). The differences in fidelity of programme implementation ultimately affected the extent to which pupils across different provinces could benefit from the programme. As RwandaEQUIP moved into the 2022-23 school year, it was crucial that programme buy-in and engagement be more uniformly distributed across provinces, so that every pupil has the same opportunities to significantly improve their learning. To do so, the programme strengthened teacher induction training sessions in order to generate improved confidence and ability in implementing the programme, while also providing more targeted support for the lowest performing schools.

Average Lesson Completion Rate in RwandaEQUIP Schools by Region

Primary 1 to Primary 5

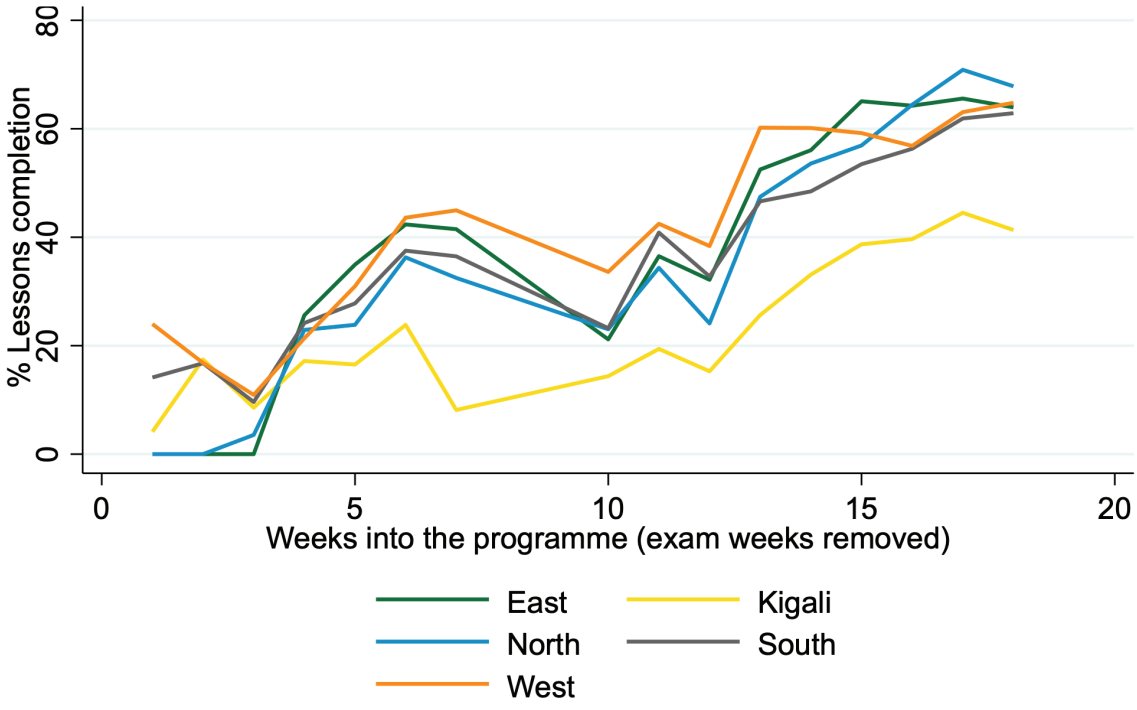


Figure 5.9

Another marked difference in programme implementation was between lower-Primary (Primary 1-3) and upper-Primary (Primary 4-5) grades. On average, lower-Primary grades had significantly higher rates of lesson completion compared to upper-Primary grades (Figure 5.10). These differences were also evident in classroom observation data — improvements in pedagogical practices were primarily driven by lower-Primary teachers, while upper-Primary teachers, on average, did not adopt better practices. As RwandaEQUIP commenced during the second term of the school year, Primary 6 teachers had the option to maintain their original lesson plans for the remainder of the 2021-22 school year, so as to not hinder pupils' preparation for the PLE at the end of the school year. Therefore, Primary 6 classes were not included in the comparisons of lesson completion since their participation was optional during the first 17 weeks of the programme.

Average Lesson Completion Rate in RwandaEQUIP Schools

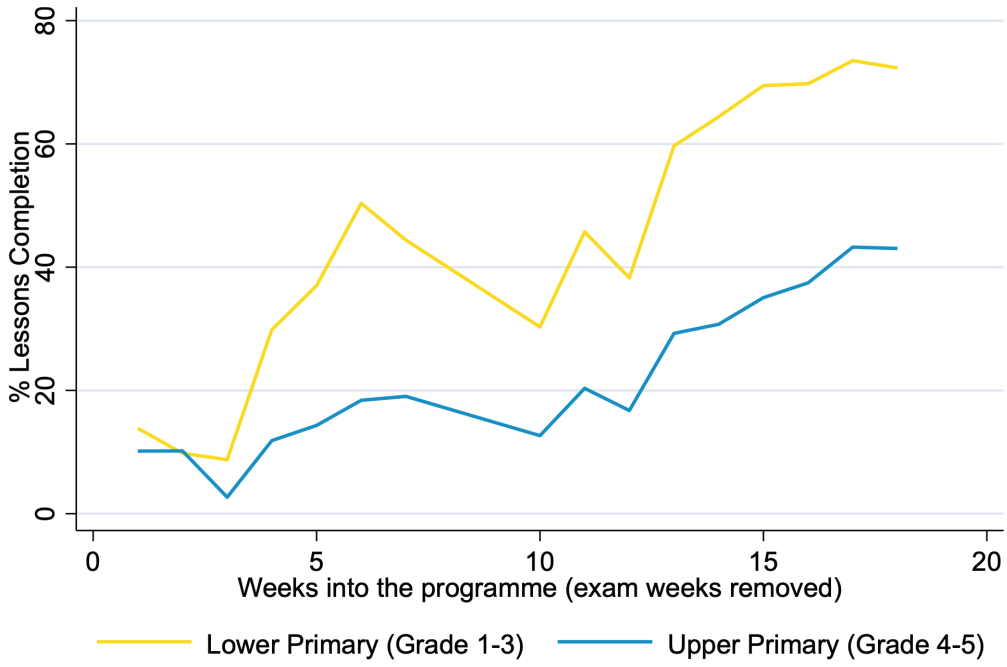


Figure 5.10

Nonetheless, due to consistently lower levels of implementation and lesson completion in Primary 4-5 strengthening the focus on lesson completion and attendance in upper Primary was a priority as Phase 2 schools joined the programme. To ensure high rates of participation in upper Primary — including Primary 6 — during the 2022-23 school year, RwandaEQUIP implemented a new PLE preparation course in Primary 6, both to offer pupils the best opportunity of success and also to boost Primary 6 teachers' confidence that the programme would support excellence on PLE.

The lowest performing pupils required additional support

Despite the large learning gains observed among lower-Primary grades, differences emerged between and within grades in terms of how well pupils responded to the curriculum. For instance, the share of non-readers in the typical Primary 1 classroom was reduced by 30% in English and by 10% in Kinyarwanda. However, the share of pupils in a typical Primary 2 classroom who could not read a single word in English did not decrease, and similar results were seen in Kinyarwanda for pupils in Primary 3 at the time. Therefore, initial findings after 17 weeks suggested that the pace of instruction, even when using the most foundational course available — as implemented by teachers in grades beyond Primary 1 — may not have adequately met the needs of the lowest-performing pupils, who might require more targeted intervention at this stage.

As pupils advance to higher grades, the curriculum naturally becomes more challenging. Consequently, a failure to acquire the necessary foundational skills in earlier grades poses a significant challenge for pupils to engage with grade-level content in later grades. This disparity can lead to varying performance levels within grades, as pupils without the necessary prerequisite knowledge continue to fall farther behind curricular expectations. Given the importance of ensuring that pupils in all grades have access to meaningful learning experiences, including those learning below grade level, the RwandaEQUIP team aimed to improve the programme's precision in appropriately levelling English and maths classes by using more active, large-scale data collection at the start of the 2022-23 school year. The RwandaEQUIP team worked to strengthen foundational literacy materials through improved data-driven alignment of English and maths instructional materials based on pupil mastery levels, as well as the rollout of new maths and English instructional programmes in upper-Primary grades. This was complemented by additional investment in PLE preparation, through the introduction of a daily PLE preparation course for Primary 6 pupils. While these approaches were primarily targeted to bridge learning gaps among those who were further behind in their learning, it also provided the opportunity to ensure that all pupils were receiving instructional content that aligned with their learning level (see Box 5 for more information regarding overambitious curricula).

Box 5

Meeting Children Where They Are: Designing Curricula to Target Appropriate Learning Levels

Curricula play a crucial role in educational systems, because they standardise content and instructional approaches on a system-wide scale. Ideally, curricula should align with the economic and developmental needs of pupils and the system. However, in many low- and middle-income countries (LMIC), researchers have documented a discrepancy between pupils' actual academic needs and curricular expectations, resulting in 'overambitious curricula' (Pritchett & Beatty, 2015). In other words, many education systems have curricula that fail to focus on key fundamental skills, such as literacy and numeracy (FLN), and instead expect pupils to learn at a much faster rate than what is feasible. This discrepancy has been suggested to be one of many contributors to the current learning crisis (Glewwe et al., 2009; Muralidharan et al., 2019). Importantly, poorly levelled curricula that drive low FLN outcomes are not exclusive to the early grades, due to the cumulative nature of learning. Students who perform poorly in early elementary school are more likely to drop out compared to their peers (World Bank, 2018). On the other hand, mastery of FLN skills is correlated with future success in secondary school and future employment opportunities (Evans and Hares, 2021; Muralidharan and Sundararaman, 2010). Therefore, effectively implemented, large-scale curricular reform focused on FLN skills in LMIC can bridge the gap between students' knowledge and policymakers' educational goals and lead to improved learning outcomes and increased regional economic productivity.

Curricular changes which increase focus on FLN, either through stronger pedagogy or more instructional time, have been shown to assist low-performing pupils in achieving national standards. For example, a study in India implemented a curriculum better suited to the median pupil with scientifically tested learning materials and accessible technology. The result was improvements in Maths and Hindi after just 4.5 months (Muralidharan et al., 2019). In Tanzania, restructuring early elementary curriculum to better suit the median pupil was found to increase all participating pupils' literacy and maths proficiency in Primary 1 and 2. Pupils were twice as likely to reach minimum benchmarks in Primary 2 maths and significantly improved their language proficiency compared to pupils who did not receive the restructured curriculum (Rodriguez-Segura & Mbiti, 2022). In both studies, researchers note that a key element to the success of these programmes was the initial low learning outcomes in the education system. Aligning instruction to the median pupil's needs led to widespread benefits, as the median pupil in many LMIC tends to have similar outcomes to the lowest performing pupils. Also, in both India and Tanzania, these curricular reforms were found to be cost-effective in that they did not require expensive inputs such as increased staffing or additional classroom resources. Because curricula can be restructured and implemented on a system-wide scale with minimal cost, curricular reforms can yield high returns in LMIC.

To develop and implement high-quality curricula, data collection and effective educational pedagogy must be utilised. Accurate and regular data collection on pupil performance is crucial for tailoring curriculum to the needs of the pupil population, as pupil performance data allows policymakers to identify areas where pupils are struggling and allocate instruction accordingly. For example, a curriculum reform in Costa Rica (Rodriguez-Segura, 2020), resulted in long-term grade repetition and insufficient improvement in literacy due to a lack of monitoring teaching methods and reliance on end-of-year results. However, when curriculum reforms are aligned with the median pupil's academic performance and incorporate effective pedagogical practices at the individual level, they can successfully enhance learning outcomes on a broader scale (Rodriguez-Segura & Mbiti, 2022). Well-designed curricula provide clear guidance to teachers regarding prioritised topics, pacing, and learning objectives for students at different academic stages, leading to improved learning outcomes without requiring high-cost measures, such as additional teachers or instructional time. By prioritising mastery of FLN in curricula before introducing new content, governments can significantly enhance the likelihood of meaningful learning outcomes for pupils.

There was strong evidence supporting RwandaEQUIP's push to transition to a single-shift classroom model wherever possible

The typical approach in most public Primary schools in Rwanda is to operate a "double-shift" model, where approximately half of the pupils go to school for the morning shift, and the other half go in the afternoon. While this approach ensures smaller class sizes, it raises the question of whether it is as effective as a "single-shift" model, where pupils attend school for a full day but typically in larger classes. To explore this question, approximately 75% of all lower-Primary classrooms were transitioned to a single-shift model, and their outcomes were compared to those in schools with a double-shift model. Pupils in single-shift classrooms made greater learning gains in English reading fluency compared to pupils in double-shift classrooms, especially for those in Primary 2 at the time (see Table 5.1). In fact, results suggest that the benefits of increased instruction time outweigh any potential negative effects of being in a larger class; there was no difference between the smaller and larger classes in terms of the learning gains achieved (see Table 8 in Appendix C).

Table 5.1: Comparison of Pupils' Performance in Single-Shift and Double-Shift Schools After 17 Weeks

Grade	Differences in gains for single-shift relative to double-shift	
	Proficiency	Fluency
Primary 1	0.1	3.25
Primary 2	0.26**	7.25**
Grade	Percent differences in gains for single-shift relative to double-shift	
	Proficiency	Fluency
Primary 1	26%	44%
Primary 2	237%	155%

Notes: The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01.

In sum, the single-shift model led to larger learning gains, while there was no evidence of learning gains being correlated with class size. Further, teachers and headteachers reported that the single-shift approach provided additional advantages in terms of increasing enrolment and gaining support from stakeholders (see Box 6 for more insights). Given the evidence, the programme made efforts to transition as many classrooms to single-shift as was feasible without overcrowding classrooms, given their typical maximum capacity of 69 pupils.

Box 6

Maximising Instructional Time for Children: Transitioning From a Double-Shift to a Single-Shift Model

The introduction of double-shift systems in education is a strategy to address scarcity of educational resources and the urgent need for increased school access. This model enables schools to operate in two distinct sessions, typically morning and afternoon, thereby doubling the institution's capacity to accommodate pupils. While this model allows school systems to leverage existing school facilities, furniture, and materials more efficiently (Kelcey et al., 2022; Murwanjama & Mureu, n.d.; Save the Children, 2018), the double-shift system also brings significant risks and challenges. The primary challenge is that a double-shift system may reduce instructional time by dividing a single school day into two shifts (Bray, 2008). In these cases, education systems might be optimising for reduced class size across shifts at the expense of instructional time. This reduction in learning time subsequently results in a narrowed curriculum that could jeopardise the frequency and quality of critical courses.

> “When I teach one class and not two, I get more time with my pupils to get to know them better […] For me, the single-shift model is good even if we have a big number of students. In the double-shift model, we don’t have that much time to teach.”
>
> –Theoneste Benimana, G.S. Bumba, Head Teacher

In light of these concerns, RwandaEQUIP transitioned approximately 75% of all lower-Primary classrooms to a single-shift model to explore whether there were additional learning benefits associated with either model. To accompany quantitative findings on learning outcomes, qualitative data were collected from stakeholders regarding the shift. One of the most consistent and prominent findings emerging from interviews with different school stakeholders was the popularity, and support for, transitioning to a single-shift model. Head teachers identified several reasons that teachers, pupils, and parents preferred the single-shift over the double-shift model, suggesting that these same factors may have contributed to the additional learning gains achieved by single-shift schools observed in our data.

> "[The pupils] like it because they can learn for longer."
>
> –Theophile Mugisha, E.P. Mbatatabata, Head Teacher

First, a single-shift model directly leads to more high-quality instructional time for pupils. Not only do pupils spend more of their day learning, but the increased interaction time enables teachers to build stronger relationships with their pupils, better track pupils' progress, as well as detect and address disengagement. Hence, it is not surprising that pupils in single-shift model schools experienced higher learning gains relative to their peers in double-shift models. Second, in nearly all of the schools where head teacher interviews were conducted, head teachers were satisfied with the transition to a single-shift model, and among schools where the transition was not possible due to infrastructural constraints, it was something that head teachers were aware of and found desirable. Although some teachers were initially hesitant about managing the larger class sizes that would result from transitioning to single-shift, most of them still took the trade-off. After experiencing the benefits, an overwhelming majority wanted to continue under the single-shift modality.

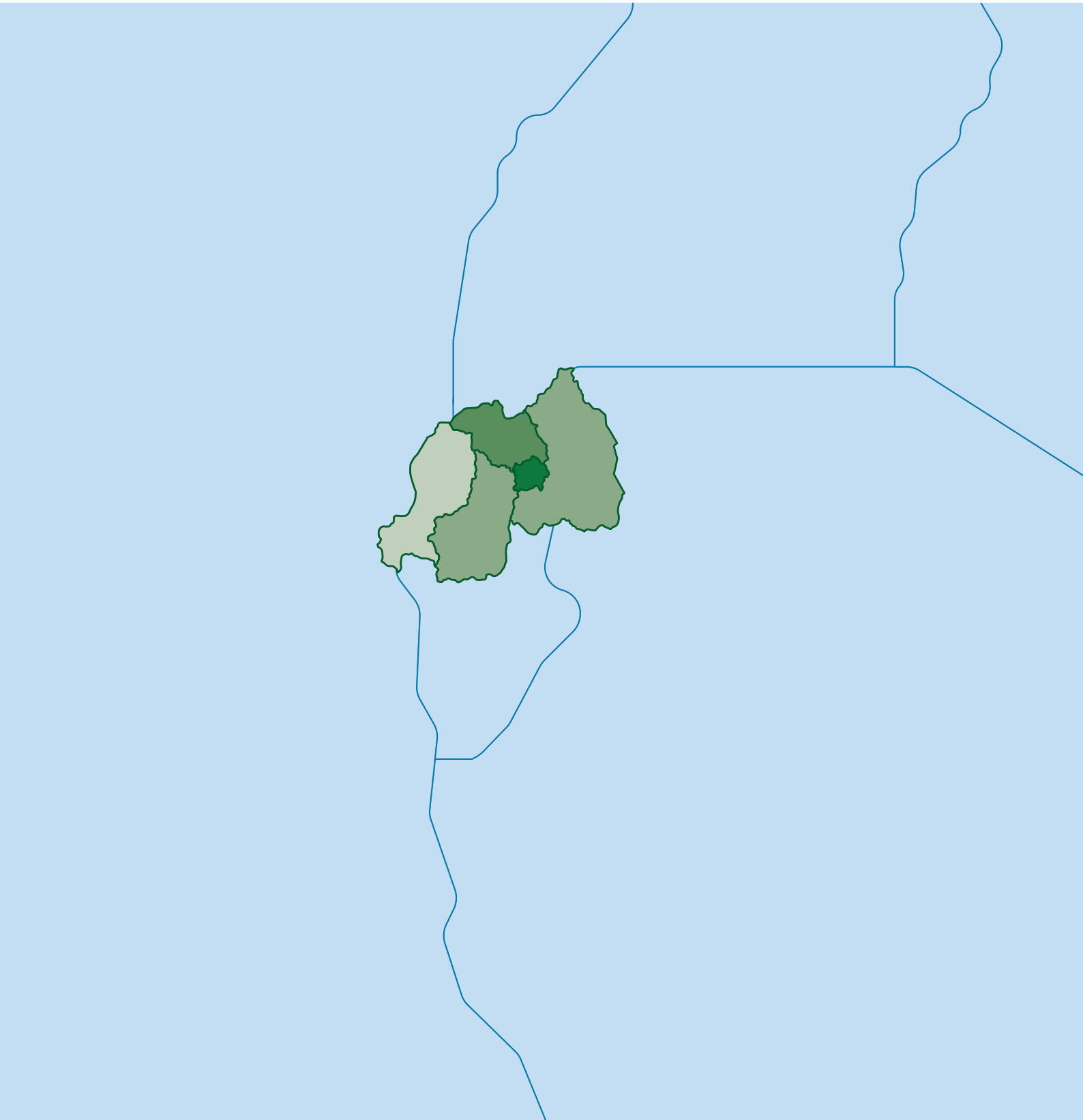
> "Big classes in [a] single-shift school would make it hard for teachers to manage classes…but [I] still would prefer the single-shift model."
>
> —Eugene Ndaruhutse, G.S. Kimisange, Head Teacher

Increased stakeholder commitment and sustained programme participation were necessary to achieve even greater learning outcomes in the coming phases of the programme

As previously noted, not all schools implemented the programme with equal enthusiasm and fidelity. While programme adoption was correlated with geographic region and grade taught, it was also correlated with larger gains in foundational literacy and numeracy; the regions that had the highest rates of lesson completion also had the largest gains in learning outcomes. Therefore, one can expect that if all schools and teachers had similar rates of programme acceptance like schools in the Southern province did, the average effects of the programme would have been even larger. To increase stakeholder support for RwandaEQUIP, it was imperative to target more efforts into the regions with lower rates of lesson completion and less pronounced improvements in learning outcomes. As teachers, parents, and pupils began to see the effect that RwandaEQUIP had on learning outcomes when properly implemented, participation and support for the programme continued to improve. Moving into the next academic year, the RwandaEQUIP team initiated a local government engagement plan that would increase awareness and ownership of the programme at all levels and to improve internal processes in order to consistently follow up on lower performing schools.

> “Only 40 days in the programme and you can already see improvements, it is amazing. It has already helped students.”
>
> – Habumugisha Leonidace, G.S. Nyarubuye, Maths Teacher

VI. Achievements After 47 Weeks of Programme Implementation



At the conclusion of the 2022-23 school year, after 47 weeks of instruction for the schools that joined in Phase 1 of RwandaEQUIP, pupils continue to demonstrate remarkable gains in learning. Pupils made significant advancements in foundational literacy and numeracy, and teachers' rates of attendance and lesson completion greatly improved. Importantly, RwandaEQUIP is strengthening pupils' standing in the competitive global skills market, as they become progressively closer to reaching grade-level benchmarks. The ongoing success of the programme underscores RwandaEQUIP's ability to improve the return on education investment in Rwanda through continuous support for teachers and pupils, high-quality instructional materials and the programme's transformative approach to learning.

Foundational Literacy

English literacy outcomes improved considerably across all grades

Between the start of the programme and the end of the 2022-23 school year, after 47 weeks, RwandaEQUIP significantly improved the English literacy skills of pupils in a typical Nursery 3–Primary 2 classroom across Phase 1 and 2 schools. **On average, pupils' proficiency on EGRA and its subskills improved by 45 percentage points, which is nearly 28 percentage points greater than the observed growth in comparison schools.** The largest advancements were in subskills such as letter name recognition, where RwandaEQUIP pupils improved at three times the rate of comparison pupils; reading fluency, where RwandaEQUIP pupils improved by twice as much as comparison pupils; and **in reading comprehension, where RwandaEQUIP pupils improved at three times the rate of comparison pupils** (Figure 6.1). As EGRA assesses performance across a variety of subskills, all of which are essential building blocks for literacy, these results demonstrate the programme's effectiveness in targeting the full range of foundational skills necessary for English literacy development.

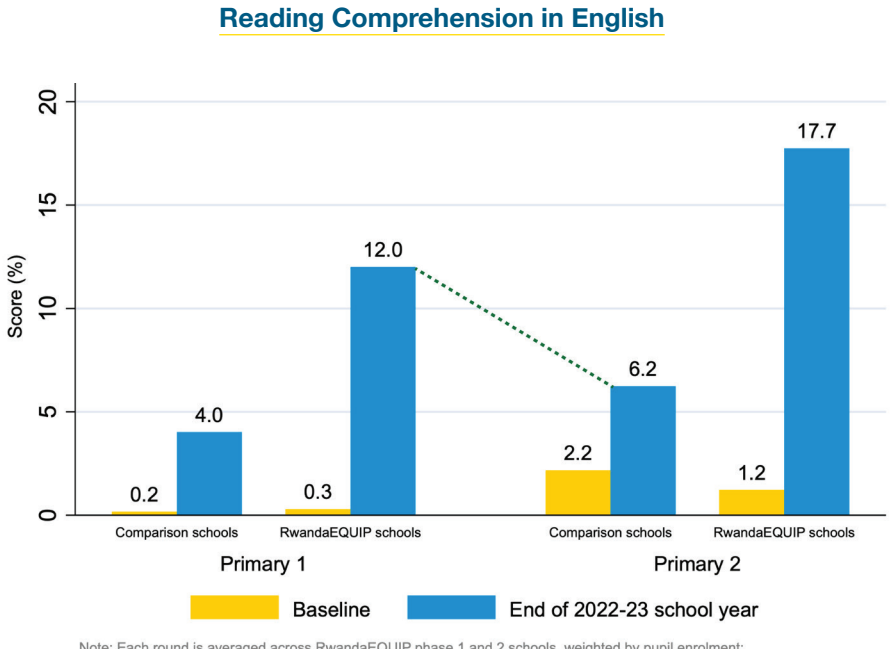


Figure 6.1

The programme is successfully targeting early literacy development in pre-Primary English education

RwandaEQUIP pupils significantly improved their proficiency in pre-literacy subskills (e.g., print orientation, listening comprehension, initial sound identification, phonemic awareness, and letter names), evidencing the programme's ability to reach pupils in the earliest stages of their literacy development. For instance, **pupils in a typical Nursery 3 class improved their listening comprehension skills by more than 20 percentage points, compared to a 6 percentage point increase in comparison schools** (see Table 9 in Appendix C). Moreover, these pupils demonstrated substantial progress in phonemic awareness — the ability to hear, understand, and manipulate the sounds in spoken words (Yopp, 1992) — a prerequisite for strong, subsequent phonics instruction. Specifically, RwandaEQUIP pupils in Nursery 3 classes improved their phonemic awareness skills by 12 percentage points more than the rate of growth among their peers in non-RwandaEQUIP schools.

This observed progress indicates that these pupils are on a promising trajectory towards achieving foundational literacy, which is crucial for their transition to Primary 1. Further, ensuring pupils enrolled in early childhood education establish a strong foundation in these pre-literacy skills is essential, given that English is the primary medium of instruction in RwandaEQUIP schools. Therefore, the positive outcomes in early literacy skills are highly encouraging, as they demonstrate the programme's effectiveness in preparing Nursery pupils for Primary school.

The share of non-readers substantially decreased

RwandaEQUIP has been highly effective in reducing the number of non-readers — those reading 0 correct words per minute. At the start of the 2022-23 school year, 94% of pupils in Primary 1 in Phase 2 schools were unable to read a single word within one minute. **After just 30 weeks of instruction, the share of non-readers in Primary 1 classes in Phase 2 schools was reduced by more than half**, decreasing by 58 percentage points (Figure 6.2). This improvement represents more than a school year's worth of additional progress for pupils who joined the programme in the 2022-23 school year; in these schools, there are now fewer non-readers in the average Primary 1 classroom than there are in the average Primary 2 classroom in non-RwandaEQUIP schools. In reducing the share of non-readers, the programme is effectively narrowing learning gaps that exist between low and high performers within the same grade or class. This enables teachers to reach more pupils with their instruction, resulting in more effective teaching and learning.

Decrease of Non-readers Within 30 Weeks of Instruction in English

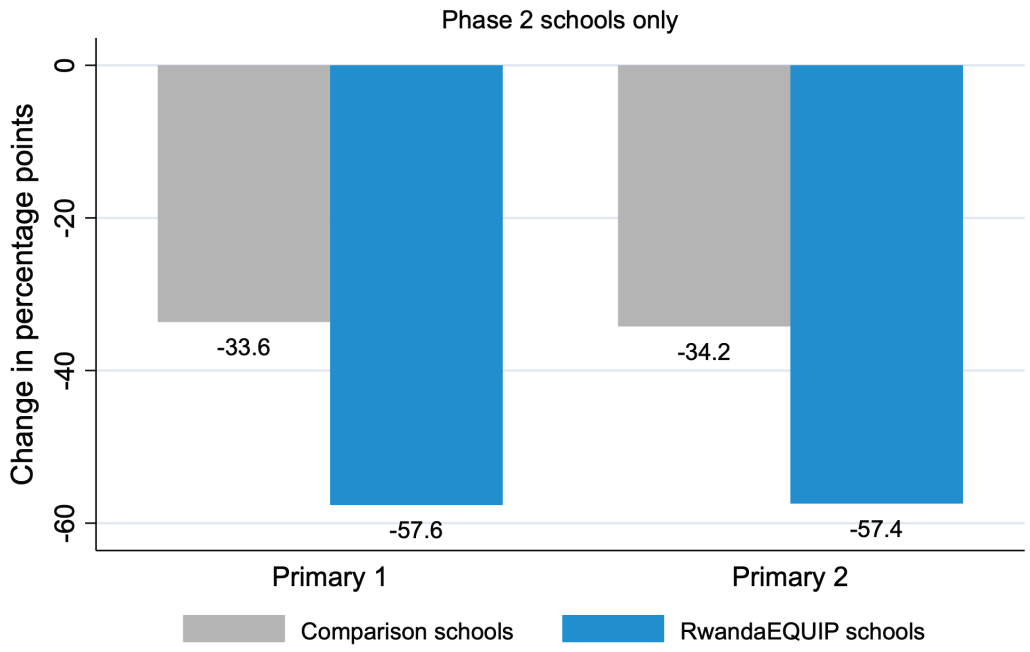


Figure 6.2

Pupils significantly improved their English reading fluency capabilities

After 47 weeks of programme implementation, RwandaEQUIP significantly improved pupils' performance in English reading fluency. On average, across Phase 1 and 2 schools, the average pupil in a Primary 1-2 classroom now read an additional 10-12 cwpm than they were able to prior to the start of the programme, which is 7 cwpm more than they would have achieved without the programme (Figure 6.3).[7] Compared to the modest progress made in non-RwandaEQUIP schools over the same period, these gains are quite large. For instance, pupils in Primary 1 in RwandaEQUIP schools began with lower average English reading fluency levels before the programme compared to those in non-RwandaEQUIP schools. Yet, these pupils quickly surpassed their non-RwandaEQUIP peers, improving their English fluency by 10 cwpm. **Compared to the average gains in a typical Primary 1 classroom in comparison schools, RwandaEQUIP pupils' English reading fluency improved at four times the rate of non-RawandaEQUIP pupils.** Similarly, the average pupil in a typical Primary 2 class began the programme with virtually the same level of reading fluency as those in comparison schools, but those in RwandaEQUIP schools improved their fluency at more than twice the rate of those in comparison schools (see Figures 3-6 in Appendix D for alternative visualisations of literacy outcomes).

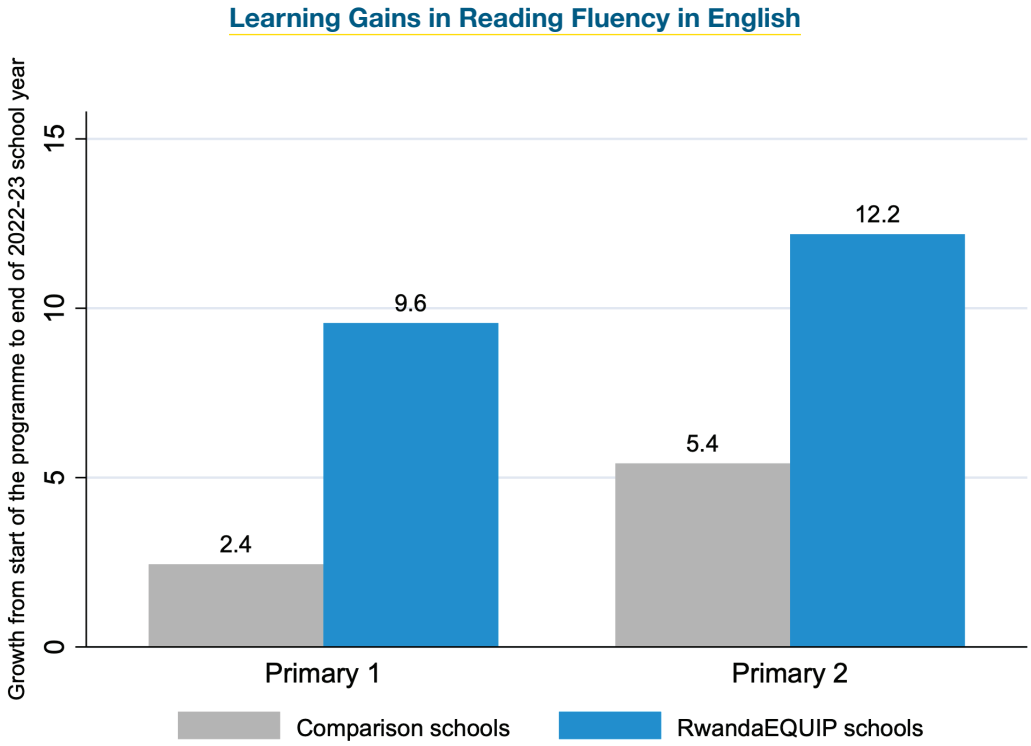


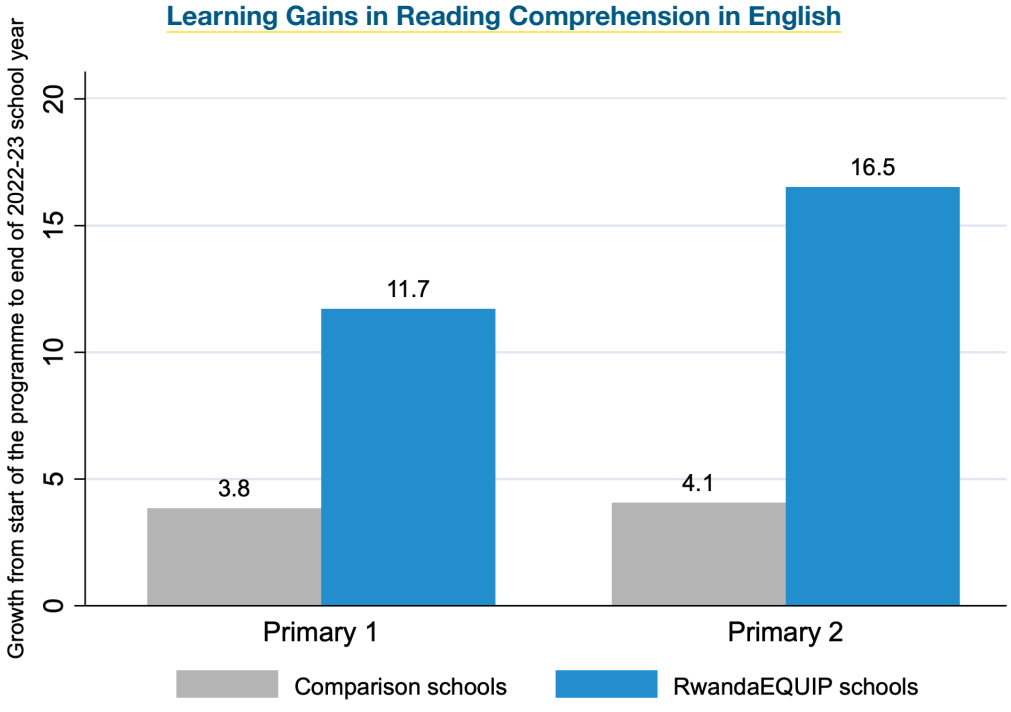
Figure 6.3

[7] As previously stated, Phase 1 of RwandaEQUIP was implemented over the course of 17 instructional weeks during Terms 2-3 of the 2021-22 school year. Phase 2 of the programme encompasses the 2022-23 school year, with 30 instructional weeks. Phase 1 schools received 47 instructional weeks, while Phase 2 schools received 30 instructional weeks in the programme; overall the programme has been active for 47 instructional weeks. In this report, unless otherwise stated, results are aggregated for the programme, weighted by the total number of pupils that joined in each phase. If results are being stated for schools belonging to the same phase (i.e., Phase 2 schools only), the results are not weighted.

Moreover, these findings show that the average Primary 1-2 pupil in RwandaEQUIP schools is significantly closer to meeting grade-level English fluency benchmarks compared to their peers in non-RwandaEQUIP schools. In RwandaEQUIP schools, the average Primary 1 pupil is meeting the national benchmark for English oral reading fluency (10 cwpm), and the average Primary 2 pupil is less than one word from meeting the grade-level benchmark (15 cwpm).[8] In contrast to comparison schools, where the average Primary 1 pupil can only read 3 cwpm and the average Primary 2 pupil can only read 8 cwpm, these findings highlight RwandaEQUIP's effectiveness in improving pupils' learning trajectories.

RwandaEQUIP pupils made large strides in reading comprehension

In line with the gains observed in reading fluency, the rate at which pupils read English with comprehension also improved, especially in Primary 2. On average, pupils in a typical Primary 2 classroom increased their English reading comprehension scores by 16.5 percentage points (Figure 6.4) — **resulting in scores nearly 15 times greater than at the start of the programme.** In comparison to pupils in a typical Primary 2 classroom in non-RwandaEQUIP schools, who improved their scores by an average of 4 percentage points, the progress demonstrated by RwandaEQUIP pupils is more than four times the rate of growth in comparison schools. These differences highlight the substantial progress that RwandaEQUIP pupils have made thus far, positioning them on a promising trajectory towards achieving advanced levels of English literacy proficiency. This proficiency, in turn, is expected to have a significant bearing on their overall performance across various core subjects.



Note: Each round is averaged across RwandaEQUIP phase 1 and 2 schools, weighted by pupil enrolment; RwandaEQUIP baseline data were collected from phase 1 in February of 2022, and phase 2 in October of 2022.

Figure 6.4

[8] See page 73 for more information regarding NESA's reading fluency benchmarks.

Pupils continue to make progress in Kinyarwanda

While RwandaEQUIP pupils had large gains in Kinyarwanda during the first 17 weeks of the programme, the effects during the 2022-23 school year were more muted. As of the end of the 2022-23 school year, RwandaEQUIP pupils' Kinyarwanda comprehension levels are on par with their counterparts in comparison schools (see Table 6.1). Given that the unofficial language of instruction in many comparison schools is likely to still be Kinyarwanda, pupils in these schools likely receive more instruction in Kinyarwanda than those in RwandaEQUIP. Therefore, the fact that RwandaEQUIP pupils' Kinyarwanda comprehension skills are not negatively impacted by the increased English instruction speaks to the level of high-quality instruction that they receive during their reduced instructional time in Kinyarwanda.

Table 6.1: Detailed LEGRA Results - 2022-23 School Year (Phase 1 and 2 Schools)

	All		Primary 1		Primary 2		Primary 3	
	Comparison schools at end of '22-23 school year mean	Treatment effect	Comparison schools at end of '22-23 school year mean	Treatment effect	Comparison schools at end of '22-23 school year mean	Treatment effect	Comparison schools at end of '22-23 school year mean	Treatment effect
Understanding words (%)	80.48	-1.27	76.02	-2.91	84.96	0.44	-	-
Writing (%)	62.86	-3.35	62.52	1.59	63.20	-8.27	-	-
Reading comprehension (%)	56.93	1.52	46.77	3.97	59.26	0.51	64.94	-0.15
General language (%)	71.59	-5.73	-	-	-	-	71.59	-5.73

Averaged across Phase 1 & Phase 2 schools, weighted by total pupil enrolment.

Foundational Numeracy

Pupils made significant progress in mathematics

After 47 weeks of programme implementation, RwandaEQUIP significantly improved pupils' maths skills. Overall, pupils across grades experienced an 18 percentage point increase in EGMA scores, which is double the 9 percentage point improvement in comparison schools. Increases in pupils' maths proficiency is supported by the average improvements across all assessed maths subskills — for instance, pupils displayed a **46 percentage point improvement in number identification,** a **25 percentage point improvement in single-digit addition** (Figure 6.5)**,** and a **17 percentage point improvement in multiple-digit subtraction** (Table 10 in Appendix C).

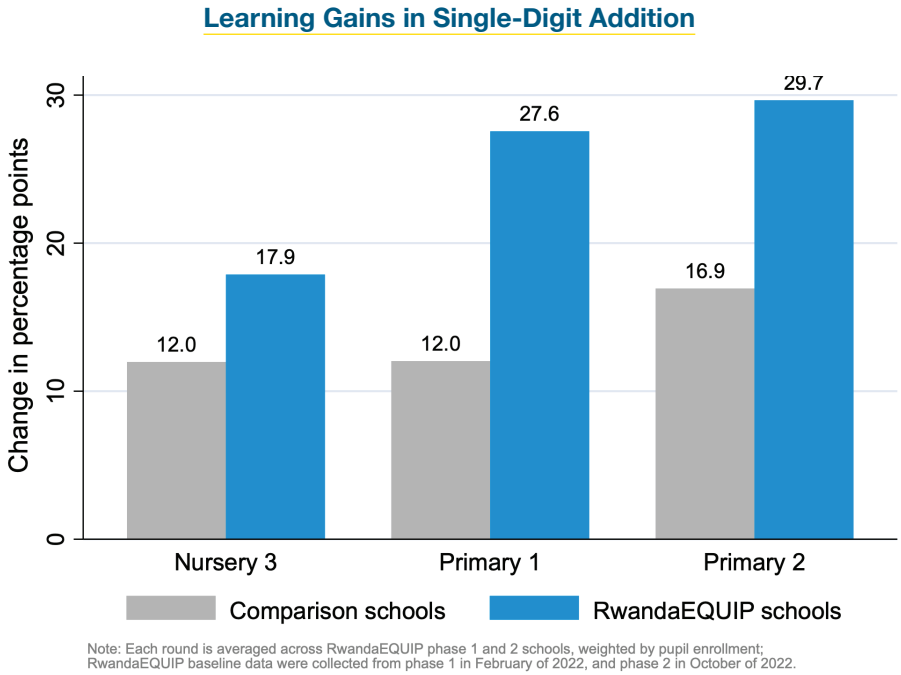


Figure 6.5

The programme was particularly effective in improving maths skills in Primary 1. For instance, pupils in a typical Primary 1 classroom improved their average scores in single-digit subtraction by 26 percentage points in the span of 47 weeks, compared to a 9 percentage point increase in comparison schools (Figure 6.6). Similar gains can be observed in single-digit addition, where pupils in a typical Primary 1 classroom improved their scores by nearly 28 percentage points, which is more than twice the rate of improvement in non-RwandaEQUIP schools. **Thus, RwandaEQUIP more than doubled the pace of learning in subtraction and addition for Primary 1 pupils.**

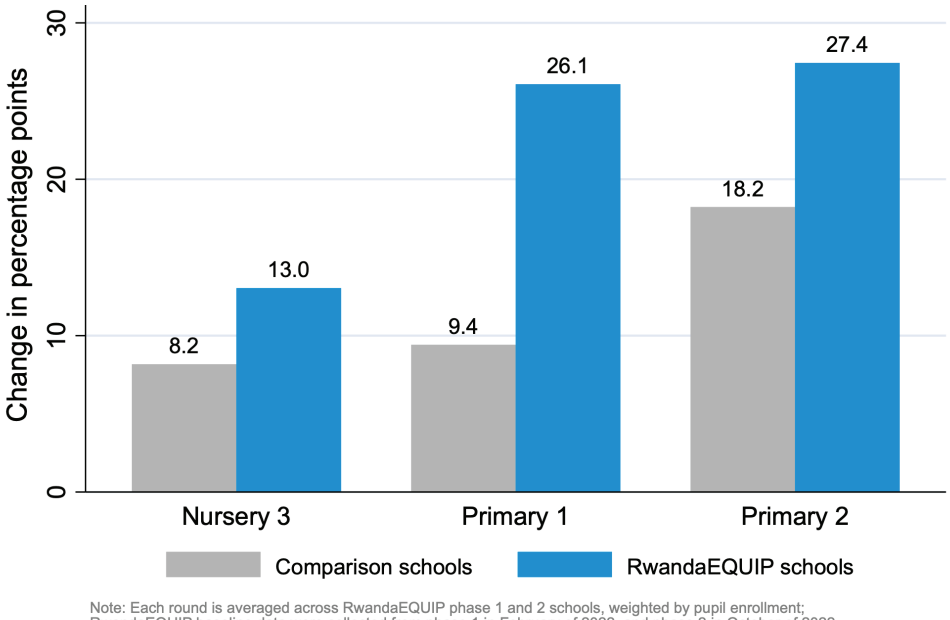


Figure 6.6

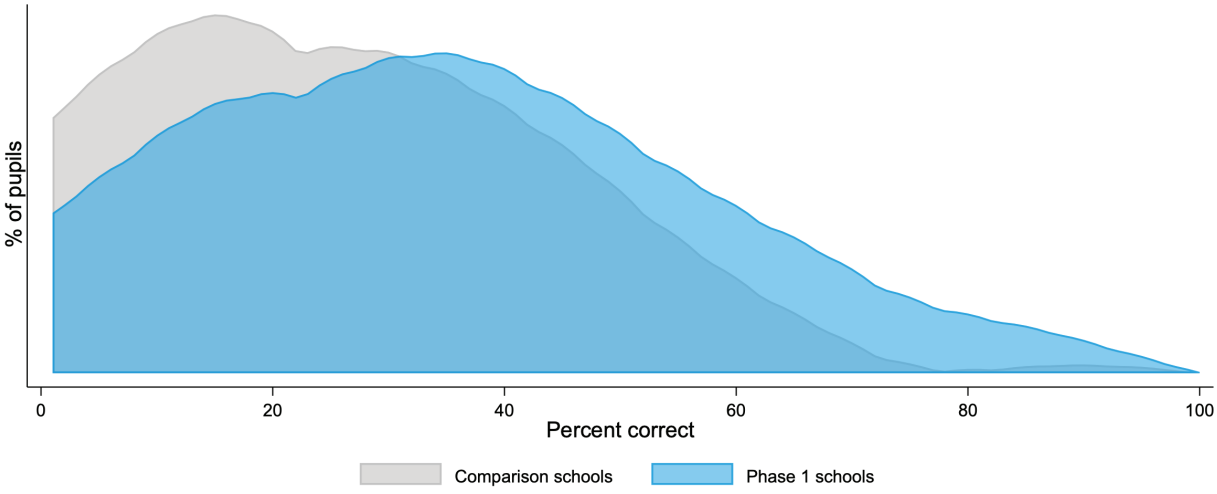
Additional Learning Insights

RwandaEQUIP supports learners across all performance levels

After 47 weeks of programme implementation, the programme has demonstrated the ability to reach pupils at various stages in their learning journey. Figure 6.7 below shows the distribution of pupils' outcomes in addition in Phase 1 RwandaEQUIP and comparison schools. The x-axis displays pupils' scores in addition (mapped as the percentage of problems answered correctly), and the y-axis shows the percentage of pupils who received that score. The further right a data point is, the higher the score, and the further up a data point is, the higher the percentage of pupils who achieve that score. This figure reveals two key findings: first, there was a positive shift in the distribution of learning levels among RwandaEQUIP pupils; second, the overall distribution of learning levels was more evenly spread in comparison to schools not in the programme. There were large reductions in the share of RwandaEQUIP pupils at the lowest end of the score distribution (pupils scoring 0-20% correct on addition problems), and a sizeable increase in the share of RwandaEQUIP pupils scoring at the upper end of the distribution (see Figure 7 in Appendix D for more details). The effects are similar in English; in reading fluency, the largest changes were seen at the lower end of the distribution (see Figure 8 in Appendix D), as evidenced by the large reduction in the share of non-readers. The share of pupils with reading fluency levels in the upper end of the distribution increased as well. Therefore, these results indicate that the programme is effective for learners across a large range of performance levels, allowing more pupils to benefit from the education they are receiving.

Distributional Effects on Addition Performance of RwandaEQUIP Phase 1 and Comparison Schools

End of 2022-23 school year



The performance was measured based on single digit addition assessment.

Figure 6.7

By targeting a wide range of performance levels, RwandaEQUIP is effectively raising pupils' learning trajectories as a whole. Figure 6.8 shows the growth in average reading fluency scores among pupils who were in Primary 1 in Phase 1 RwandaEQUIP schools at the start of the programme (February 2022) compared to that of the same group in non-RwandaEQUIP schools. After 47 weeks of instruction in Phase 1 schools (the end of Primary 2 for this cohort), RwandaEQUIP pupils display a significantly higher average rate of reading fluency compared to their peers in non-RwandaEQUIP schools, which is further indication that the programme effectively elevating overall proficiency levels while also reducing heterogeneity in learning outcomes among pupils in the same grade.

Growth in Average Reading Fluency

For the cohort of pupils that were in Primary 1 at Year 1 baseline

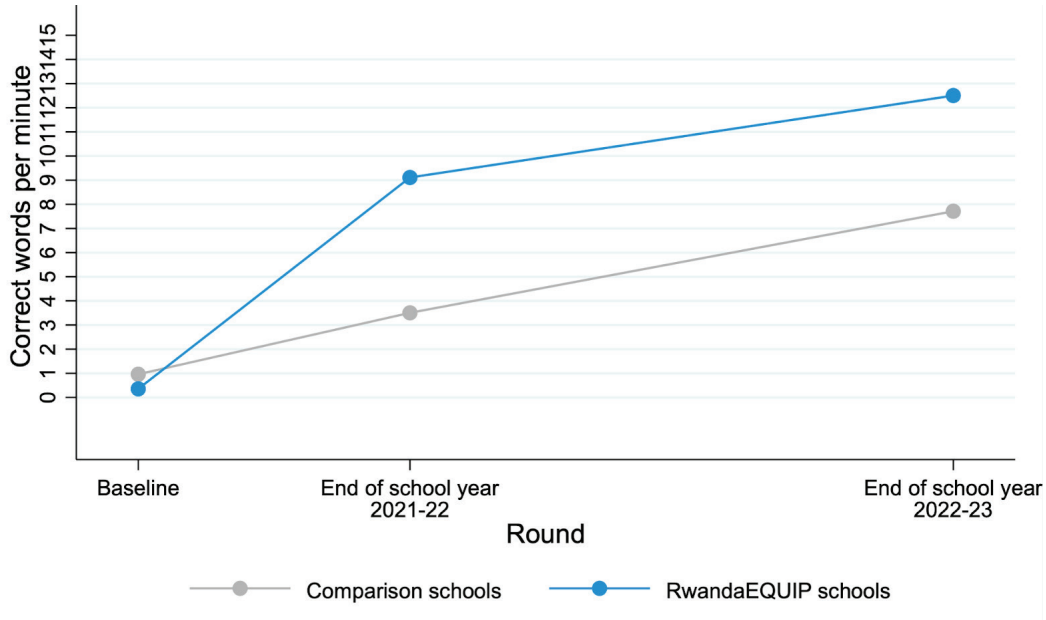


Figure 6.8

When visualising the growth in average reading fluency as a distribution of all pupils in this cohort, it is clear that there is significantly less dispersion in learning levels in RwandaEQUIP schools than in comparison schools. As shown in Figure 6.9, the median fluency level (represented by the horizontal line within the box) in RwandaEQUIP (treatment) schools has significantly increased from baseline to the end of the 2022-23 school year, while comparison schools displayed marginal improvements in this metric. In addition, there has been a large reduction in the number of high-performing outliers (represented by the dots in Figure 6.9) in RwandaEQUIP schools, indicating a shift towards a more homogeneous learning distribution within grades. In contrast to comparison schools, which appear to mainly target high-performing pupils — evidenced by the low average scores in addition to numerous high-performing outliers in these schools — these results indicate that RwandaEQUIP is effectively targeting the median pupil. In other words, these findings highlight that by targeting instruction to a wide range of performance levels, as opposed to only targeting instruction to the top performers — as is the case in many other educational contexts (Glewwe et al., 2009) — RwandaEQUIP is effectively improving learning outcomes for pupils across a wide range of performance levels.

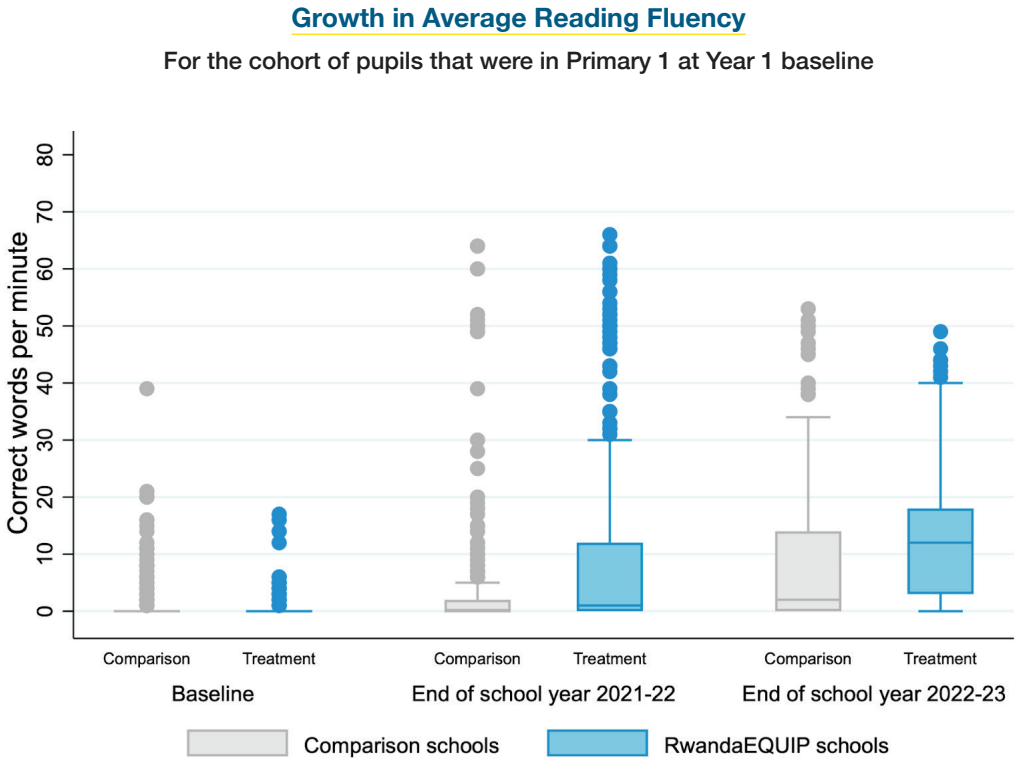


Figure 6.9[9]

[9] As previously noted, the data are collected from a different set of pupils in each round of data collection. Therefore, the data points (the blue and grey dots) shown in Figure 6.9 do not represent the same pupils for the three rounds of data collection, but instead represent the outcomes of the random sample of pupils collected at that point in time.

The share of pupils who meet grade-level benchmarks increased

In 2022, the Rwandan Ministry of Education, through NESA and REB, established benchmarks for each subject and grade level in Primary school in conformity with the Education 2030 Framework for Action (UNESCO, 2015), which calls on countries to establish "appropriate intermediate benchmarks for the SDG indicators, seeing them as 'indispensable for addressing the accountability deficit associated with long-term targets'". The developed benchmarks were a product of two workshops, where educational experts and key stakeholders determined appropriate proficiency levels that were both aligned to the Rwandan context and would lead to the achievement of United Nations' Sustainable Development Goal 4: To ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (NESA, 2022). Please refer to Appendix E for the 2022 benchmarks for English and mathematics.

After 47 weeks of programme implementation, RwandaEQUIP increased the share of pupils who reach the grade-level benchmarks set by NESA (See Table 11 in Appendix C for more information). For example, only 1% of Primary 1 pupils in Phase 1 schools met NESA's grade-level benchmark in English fluency at the start of the programme.[10] By the end of the 2021-22 school year, after 17 weeks of programme implementation, 30% of Primary 1 pupils in Phase 1 schools met grade-level benchmarks, and by the end of the 2022-23 school year, 37% of this group of pupils — Primary 2 pupils in Phase 1 schools — met grade-level benchmarks (Figure 6.10). The share is even greater in Phase 2 schools, with 48% of pupils in Primary 2 reaching NESA's English benchmark at the end of the 2022-23 school year. Compared to schools that were not part of the programme, where only 24% of Primary 2 pupils met the grade-level benchmark for English, **RwandaEQUIP is bringing twice as many pupils closer to meeting grade-level standards than would have occurred absent the programme**, indicating positive progress on the trajectory towards foundational skill accumulation.

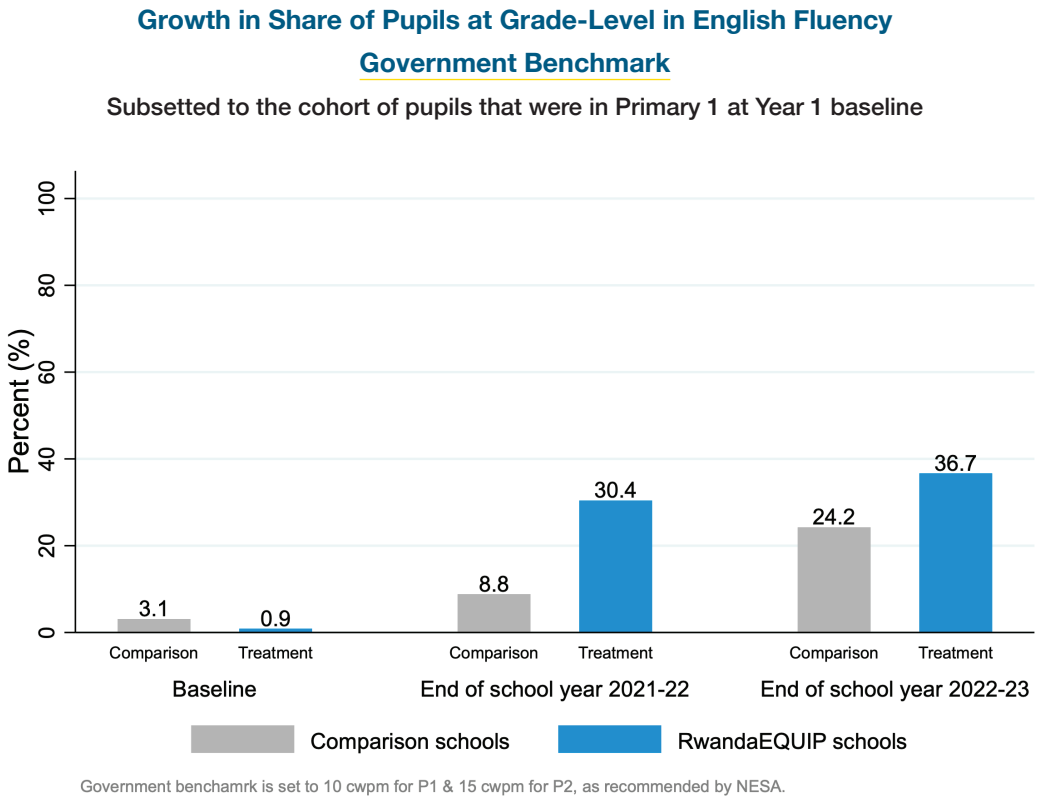


Figure 6.10

[10] The government benchmarks for "Meet" or above are 10 cwpm for Primary 1, and 15 cwpm for Primary 2 (NESA, 2022).

Although pupils made large strides in foundational learning, PLE scores have not yet improved as a result of the programme

As of the end of the 2022-23 school year, RwandaEQUIP has not had a substantial impact on PLE scores. While initial observations suggest a lack of improvement in PLE scores, potentially placing RwandaEQUIP schools behind comparison schools in this regard, a deeper analysis of the baseline data from 2019 — before RwandaEQUIP — reveals considerable differences in PLE scores between treatment and comparison schools. Due to changes in the PLE grading system in 2022, it is not possible to perform a difference-in-differences analysis from 2019-2023.[11] Although, considering the sizeable differences (0.20 SD, in favour of the comparison group) between comparison and Phase 1 schools before the programme, and between comparison and Phase 2 schools (0.14 SD, in favour of the comparison group) before the start of the programme (Figure 9 in Appendix D), one can interpret the results seen in 2023 to encompass pre-existing differences between comparison and treatment schools. When adjusting for these differences, and weighing the results based on the number of pupils that joined in each phase, the actual negative effect of the programme on PLE scores is much smaller than initially observed (0.06 SD) — amounting to a difference of less than 0.1 PLE points scored out of 30 between RwandaEQUIP schools and comparison schools (Figure 6.11). Therefore, the programme essentially had a null effect on PLE scores. Nonetheless, RwandaEQUIP will continue to investigate whether the null effect is due to the sample composition at baseline, or whether the gains made in foundational learning thus far have simply not yet translated into improvement in PLE scores.

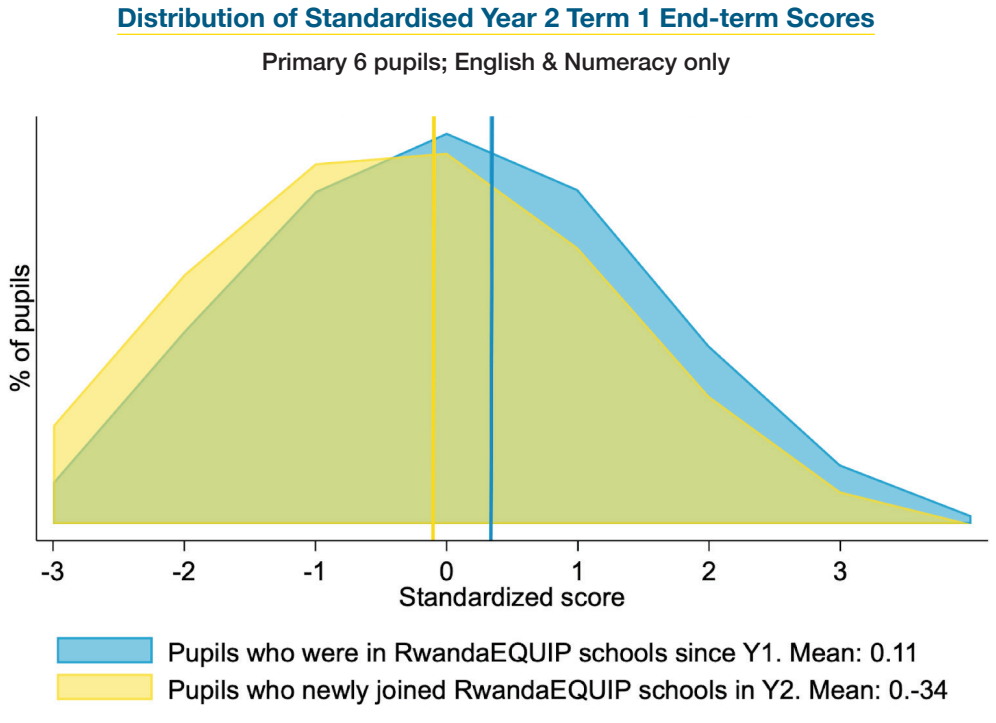


Figure 6.11

[11] The system that was used to grade PLE exams before the 2021-22 school year had a grade scale of 1-9 for each tested subject, whereas in the new grading system, each subject is graded on a raw scale of 0-100 and translated into a grade value of 0-6 (F, S, E, D, C, B, A, respectively).

Differential Effects in Learning Outcomes

During the 2022-23 school year, the programme had a larger effect on Phase 2 schools compared to Phase 1 schools

While pupils across all schools demonstrated significant growth in foundational learning, pupils in Phase 2 schools exhibited larger average gains compared to pupils in Phase 1 schools. For example, the average Primary 1 pupil in Phase 2 schools improved their fluency by 11 cwpm during the 2022-23 school year (Figure 6.13), whereas Primary 1 pupils in Phase 1 schools improved their fluency by an average of 7 cwpm over the same period of time (Figure 6.12).

Learning Gains in Reading Fluency Within 30 Weeks of Instruction in English

Phase 1 schools only

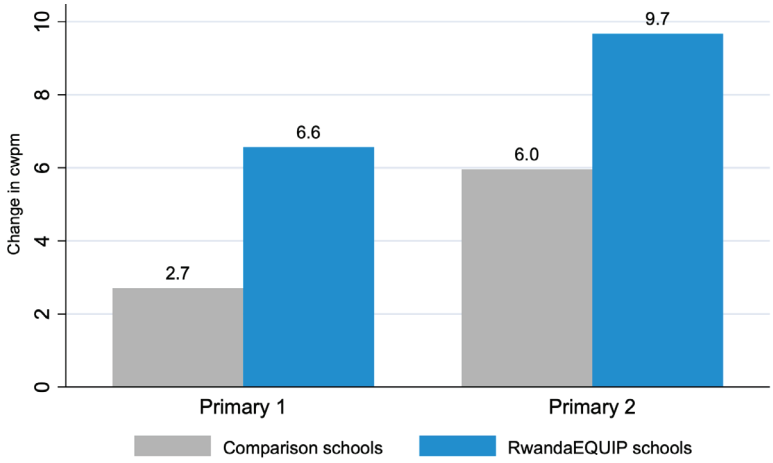


Figure 6.12

Learning Gains in Reading Fluency Within 30 Weeks of Instruction in English

Phase 2 schools only

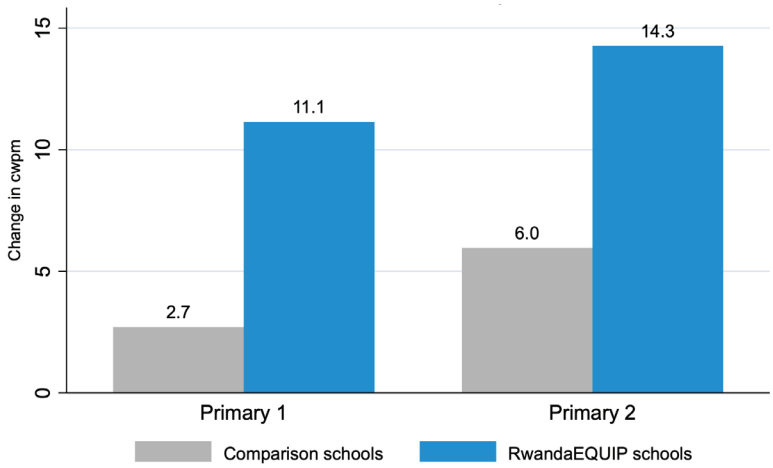


Figure 6.13

In maths, the effects varied by subskill — Nursery 3 and Primary 2 pupils in Phase 2 schools performed better than those in Phase 1 schools in less advanced subskills such as single-digit addition and subtraction (see Figures 6.14 & 6.15). However, in more advanced skills such as multiple-digit addition and subtraction, pupils in Phase 1 schools outperformed those in Phase 2 schools during the 2022-23 school year. While these comparisons do not take into account the progress made in Phase 1 schools in the first 17 weeks of the programme, they still highlight meaningful differences in the observed outcomes for each group. Moreover, while differences exist in the observed outcomes in Phase 1 and 2 schools, both groups still saw very large improvements in learning, significantly outperforming their peers in comparison schools in English and maths competencies.

Learning Gains in Single-Digit Addition Within 30 Weeks of Instruction

Phase 1 schools only

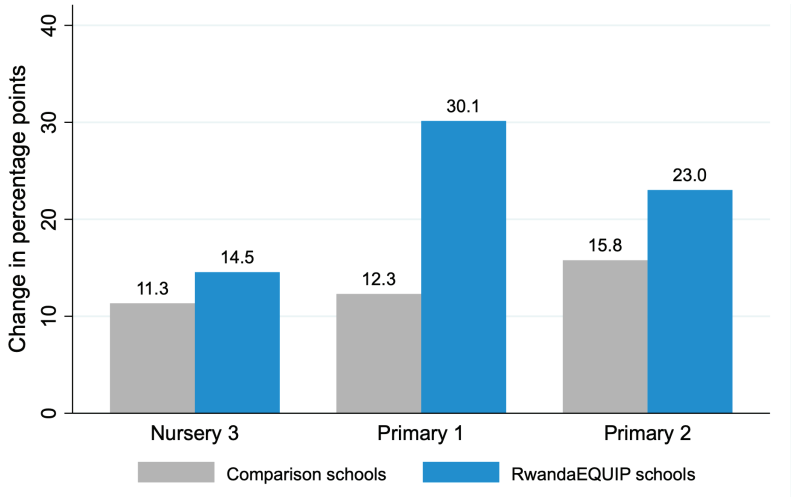


Figure 6.14

Learning Gains in Single-Digit Addition Within 30 Weeks of Instruction

Phase 2 schools only

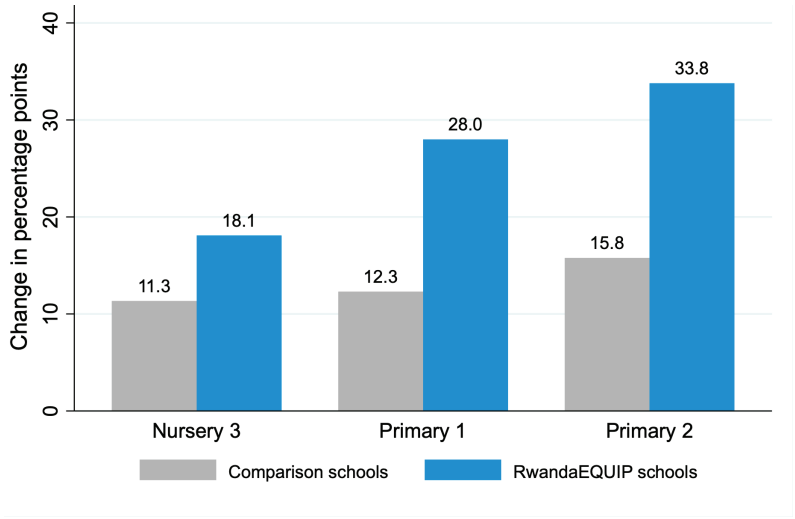


Figure 6.15

In addition, the share of pupils performing at grade-level by the end of the 2022-23 school year was significantly greater within Phase 2 schools than Phase 1 schools. At the end of the 2022-23 school year, after 47 weeks of programme participation for Phase 1 schools, 37% of pupils in a typical Primary 2 class in Phase 1 schools met grade-level benchmarks in English. In comparison, 48% of pupils in a typical Primary 2 class in Phase 2 schools — who participated in the programme for 30 weeks — met grade-level benchmarks at the end of the school year. Importantly, the observed differences between these groups cannot be explained by differences in lesson completion; during the 2022-23 school year, there was less than a two percentage point difference in the average lesson completion rates between Phase 1 and Phase 2 schools in both English and maths classes (see Figures 10 & 11 in Appendix D).

There are various factors which could have contributed to the differences in learning outcomes between Phase 1 and Phase 2 schools. For instance, 10-13% of Primary 2 pupils in Phase 1 schools during the 2022-23 school year had not participated in RwandaEQUIP during its first 17 weeks of implementation — when they would have been in Primary 1. As these new pupils had fewer weeks of participation compared to those in the same grade who joined the programme when it commenced, the programme's effect on learning in Phase 1 schools may be underestimated due to the lower dosage of instruction received by new pupils. Moreover, these results may also be partially explained by the fact that teachers in Phase 2 schools underwent training more recently than teachers in Phase 1 schools, and the quality of the training may have been higher for teachers in Phase 2 schools due to programmatic adjustments made after the first 17 weeks of the programme.

Nonetheless, the fact that pupils in Phase 2 schools demonstrated large gains in foundational learning after just 30 weeks speaks to the programme's effectiveness as it continues to mature and expand to reach more pupils across Rwanda. In order to maintain these gains for all schools, regardless of in which phase they join, it is crucial to understand the learning levels of all current and incoming pupils so that the programme can effectively tailor its instruction to meet the needs of all learners. Additionally, RwandaEQUIP will continue to regularly conduct teacher training and coaching sessions to ensure that all pupils have the same opportunities to engage with high-quality lessons, thus, ensuring more equitable learning outcomes for all pupils.

Learning outcomes also varied significantly across provinces

The impact of the programme was more pronounced in certain provinces than others. Differences by province had already emerged within 17 weeks of the programme, and those differences were explained, in part, by significant variation in the average lesson completion rate across provinces. After 47 weeks of programme implementation, although rates of lesson completion and teacher attendance were consistent across all provinces by this point, suggesting improvements in the previously lagging regions, the growth in learning outcomes still varied significantly across provinces. For example, pupils in the Western province improved their reading fluency at a rate four times greater than their counterparts in Kigali (see Table 6.2). There were similar outcomes in numeracy; pupils in the Western province improved their single-digit subtraction scores by 37 percentage points, while pupils' scores in the Southern province only improved by 2 percentage points. In light of these results, it may be worth further investigation to ensure that all provinces and schools are implementing the programme with equal fidelity, in order to foster more equitable learning opportunities across the board.

Table 6.2: Provincial Differences in Learning Outcomes After 47 Weeks, By Assessment and Subskill

			Province				
Assessment	**Subskill**	**All**	**Kigali**	**East**	**West**	**North**	**South**
EGRA	Reading fluency	6.94	3.12	7.85	12.20	6.32	5.68
	Reading comprehension	10.14	15.55	13.95	12.68	0.74	7.33
EGRA	Level 1 addition	11.55	-10.21	22.03	33.03	12.18	8.02
	Level 1 subtraction	10.39	-14.11	20.63	37.05	11.80	1.98
LEGRA	Reading comprehension	1.52	-15.81	8.15	2.75	-0.42	8.48
	Sample size (No. of schools)	80	14	21	15	15	15

Averaged across Phase 1 & Phase 2 schools, weighted by total pupil enrolment.

The programme maintained gender parity in learning outcomes

Despite rising awareness and accompanying efforts to promote gender equity in education, large gender gaps still exist in learning achievement in many settings, most often leaving girls at a disadvantage. When exploring potential learning gaps between boys and girls at the start of the programme, it was found that, at least in the subjects and grades tested, there were very small, if any, differences in pupils' performance between boys and girls. After 47 weeks of programme implementation, learning outcomes were roughly equal for boys and girls (see Table 12 in Appendix C). Therefore, the programme worked equally well for both boys and girls, maintaining the gender equity in learning outcomes found at the start of the programme — but at higher levels of performance.

Pupils achieved significant growth in learning under teachers with varying levels of English fluency

To understand whether teachers' English language skills impacted the gains observed in RwandaEQUIP schools after 47 weeks, this study again examines the extent to which learning gains are correlated with average teacher English fluency at the school level. As previously discussed, teachers in treatment and comparison schools possessed roughly the same level of English fluency at the start of the programme, and after 17 weeks of programme implementation, there was no evidence found to suggest that teachers' English fluency impacted the overall effectiveness of the programme. After 47 weeks of programme implementation, data from pupils who were in Primary 1 in Phase 1 schools when RwandaEQUIP initially launched (who were in Primary 2 during the 2022-23 school year) reveal that average pupil growth was achieved in schools with varying degrees of teacher English reading fluency, and as such, this factor is, at best, weakly correlated to pupil growth (Figure 6.16). When analysing these outcomes within each grade only for the 2022-23 school year, the data show an even weaker, if any, correlation between pupil growth in learning and teacher fluency (see Appendix D, Figures 12 & 13). This aligns with the earlier findings from the initial 17 weeks of the programme, which suggest that teacher fluency has little to no discernible impact on pupil learning growth when using the type of structured pedagogy support that RwandaEQUIP provides, particularly among teachers who already demonstrate a certain level of English fluency, as observed in this sample. Overall, pupils across all schools made significant learning gains regardless of variations in teachers' English fluency, further highlighting the programme's effectiveness in improving learning outcomes for pupils across diverse educational settings.

Relationship Between Teachers' English Fluency and Pupils' English Fluency Growth in 47 Weeks

For the cohort of pupils that were in Primary 1 in Year 1

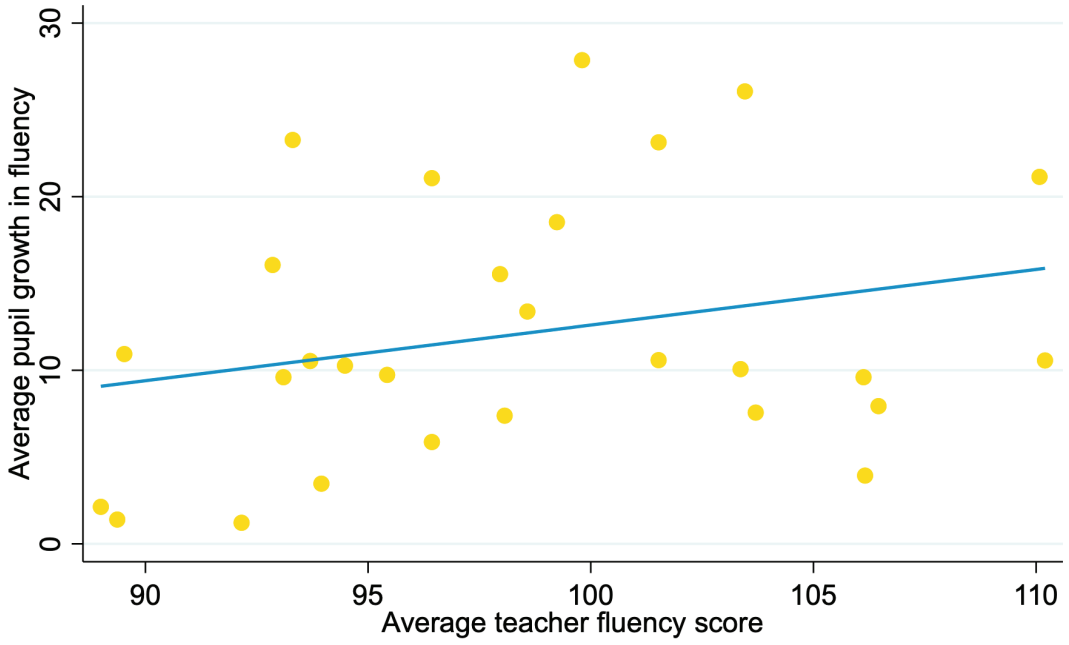


Figure 6.16

Teacher Attendance and Lesson Completion

The ecosystem of RwandaEQUIP enables the tracking of certain teacher behaviours, including attendance and lesson completion. These metrics are tracked automatically through the teacher tablets, which allows for the monitoring of programme implementation in RwandaEQUIP schools and classrooms. As such, these data provide insights into the degree to which teachers are adopting the programme and delivering it as intended, and are not measures of programme effect as compared to teacher behaviours in non-RwandaEQUIP schools. Observed improvements in teacher attendance and lesson completion over the course of the programme thus far serve as positive indicators that the programme is continuing to gain more buy-in and support among teachers, which is further reinforced by the observed learning gains among pupils.

RwandaEQUIP is effectively reducing the fiscal burden of teacher absenteeism

Data indicate that the increased teacher accountability enabled by the RwandaEQUIP ecosystem was accompanied by a marked decrease in teacher absenteeism across the system. **Since the start of the programme, the proportion of pupils without a teacher due to teacher absenteeism has been reduced by more than two-thirds, dropping from 34% to 11%** (Figure 6.17). Ensuring that teachers are consistently on time and present in their schools and classrooms plays a vital role in driving programmatic implementation and supporting system-wide coherence across the RwandaEQUIP network of schools. These factors, in turn, are crucial for facilitating learning outcomes among pupils by ensuring that they receive sufficient exposure to high-quality instruction.

Teacher Attendance Rate Since the Start of the Programme

By academic term

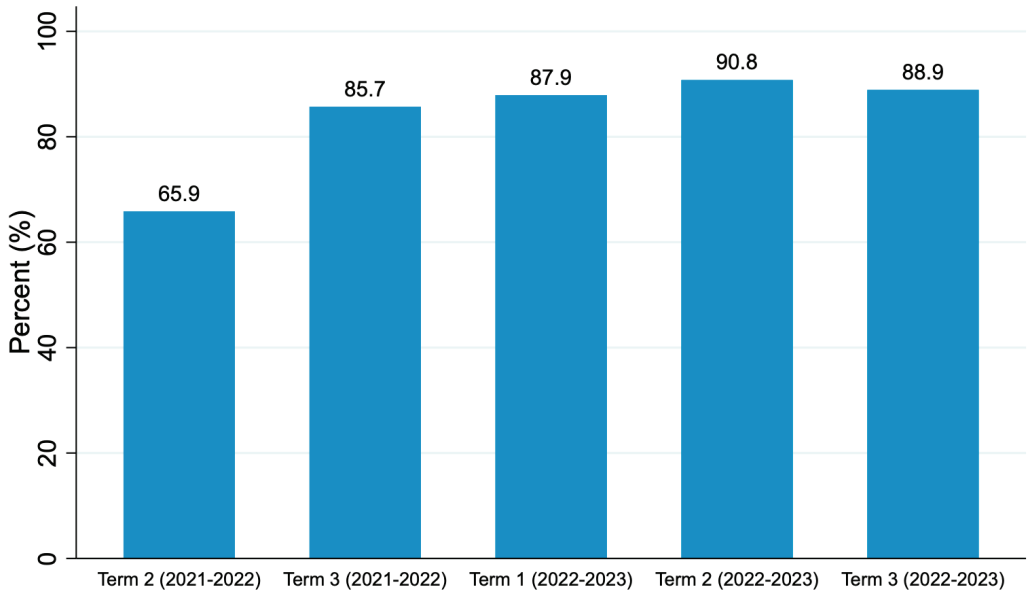


Figure 6.17

As a teacher's main function is inside the classroom, teacher absenteeism can be conceptualised as a "fiscal burden", in that governments are using public funds to cover salaries for teachers who are not able to fulfil the full extent of their duties. Researchers in other contexts have attempted to quantify the extent of the fiscal burden posed by teacher absenteeism as a way to put into perspective the magnitude of the problem, not just for education but for the broader welfare of the nation (Muralidharan et al., 2017; Schipper & Rodriguez-Segura, 2022). To quantify the fiscal burden of teacher absenteeism, researchers have previously used data from statistically representative samples of teachers to understand what portion of the time the average teacher is expected to be absent from the classroom. Then, this number would be multiplied by their annual salary to answer the question: What share of the public expenditure for teacher salaries is not being invested in the classroom due to teachers not coming to school?

During the first three weeks of RwandaEQUIP, it was observed that teachers came to school an average of 66% of the time they were expected.[12] If the average teacher in Rwanda makes an annual salary[13] of approximately 2.5 million RWF (2,069 USD),[14] then during the first weeks of the programme, the rate of teacher absenteeism implied that approximately 878,000 (703 USD) per teacher of these funds would not be effectively spent to yield a return on investment for educational outcomes. Since there were roughly 3,042 teachers within the programme during the first year, this implied a total burden of teacher absenteeism of more than 2.6 billion (2.1 million USD) in the 100 RwandaEQUIP schools at the start of the programme.

> "It used to be terrible before. Teachers used to miss work several days per month, but now absenteeism is low."
>
> – Ntindendereza Jeanine, G.S. Gakiri, Head Teacher

[12] In this case, teacher attendance data before the programme are not accessible — there are only data for teacher attendance once the programme started. As such, any estimates of teacher absenteeism that are presented as "pre-RwandaEQUIP" are likely already overestimates — if one assumes that the programme had immediate positive effects on teacher attendance — as teachers would have already been trained with the RwandaEQUIP methodology. However, a major strength in this case is that there are highly reliable teacher attendance data for all teachers, and therefore, the patterns in teacher attendance can be pinpointed with higher precision over time for teachers within RwandaEQUIP.
[13] The average teacher salary was estimated using government expenditure data from 2022. Source: UNESCO Institute for Statistics (UIS), http://data.uis.unesco.org/ (Retrieved on November 3, 2023).
[14] The exchange rate is 1,250 RWF per 1 USD as of December 2023.

By the end of the 2022-23 school year, teachers in the programme were coming to school 89% of the time, improving their attendance rates by more than one-third. This large improvement in teacher attendance did not come as a surprise, as the RwandaEQUIP ecosystem facilitates the tracking of teacher engagement and increases visibility into these measures. Therefore, the increase in teacher attendance means that the magnitude of the fiscal burden of absenteeism has decreased by approximately 594,000 RWF (475 USD) per teacher. In other words, across the Rwandan education system, **more than 1.75 billion RWF (1.4 million USD) of the government's public funds — previously foregone each year due to lower teacher attendance — are now being effectively spent on education after 47 weeks of RwandaEQUIP** (see Table 13 in Appendix C). While these estimates do not take into account the additional 4,597 teachers that joined the programme in the 2022-23 school year, they provide valuable insights into how improving teacher attendance can have positive implications for broader national policy and spending over time (see Box 7 for more information regarding teacher absenteeism).

Box 7

Teacher Absenteeism in Low- and Middle-Income Countries: Challenges, Implications, and Effective Solutions

Teacher absenteeism is a deep and widespread challenge that jeopardises returns on substantial investments in pupil learning outcomes and enrolment outreach (World Bank, 2018). Teacher salaries in low- and middle-income countries (LMIC) often represent a significant portion of the public education budget. For instance, in Uganda, Tanzania, Nepal, and Namibia, 60–95% of the government budget that is earmarked for education is invested in teacher salaries. Yet, high rates of teacher absenteeism have been consistently recorded across many LMIC: In a global study, teachers were not in school 16% of the time in Bangladesh, 18% of the time in Togo and Senegal, and 45% of the time in Mozambique (Chaudhury et al., 2006). Even among the teachers that were present in school across 8 sub-Saharan African countries, less than half of them were found to be in their assigned classrooms during instructional time when measured by the World Bank via drop-in visits (World Bank, 2018). Hence, the large shares of fiscal resources spent on teacher salaries, coupled with the ingrained prevalence of teacher absenteeism, indicates that the fiscal and educational repercussions of this issue are a serious policy concern that deserve immediate governmental action.

From a fiscal standpoint, one study in India found that an unauthorised teacher absence rate of 23.6% cost the government an estimated 1.5 billion INR in 2017 alone (Muralidharan et al., 2017). The World Bank has estimated that teacher absences also cost Senegal, Mozambique, and Tanzania over 300 million USD each in 2013 (World Bank, 2018). This financial loss not only correlates with diminished learning gains due to inadequate instruction time and quality, but also with the payment of salaries using limited government funds in contexts where public budgets are particularly constrained.

From an academic perspective, for the pupils in the system, the most direct consequence of teacher absenteeism is significantly reduced instructional time, which, in turn, translates into weaker learning outcomes. According to The World Bank's Service Delivery Indicators, out of the 8 LMIC that were surveyed in sub-Saharan Africa, including Nigeria, Kenya, Uganda, and Togo, an average of 2 hours and 46 minutes of instructional time was lost daily due to teacher absenteeism (World Bank, 2018). Teacher absenteeism not only detracts from total learning time, but also negatively impacts the quality of learning that takes place in school (Méndez Vargas, 2016). When classes are combined to compensate for inconsistent teacher attendance, pupils experience disruptions in their lessons. Furthermore, chronically absent teachers were found to be less productive in school when compared to their peers (Utami & Vioreza, 2021). This lack of consistency and quality contributes to parents' and pupils' poor

perceptions of the public education system, which leads to lower rates of enrolment and attendance among pupils, therefore permanently stunting their positive educational trajectories (World Bank, 2018).

High rates of teacher absenteeism are symptomatic of inadequate management systems and data tracking, which fails to facilitate accountability and motivation. Investment in increased teacher attendance can lead to more efficient national education systems that yield greater learning outcomes. By not targeting educational management systems and data collection, national governments are continually funnelling funds into an ineffective system that produces increasingly diminished returns.

Despite the severity of the challenges around teacher absenteeism, cost-effective, evidence-based solutions have been shown to yield high-impact results that mitigate this systemic issue. Studies done by entities like the World Bank and UNICEF suggest that funds should be directed towards improving accountability systems and to the oversight of teachers, rather than towards other applications, such as increasing staffing where shortages are not prevalent, or unconditional salary increases. For example, one study in Chile found that increasing teacher salaries by 4–30% decreased instructional time per pupil by an average of 1 hour a week, and another study in Indonesia found that the unconditional doubling of teacher salaries did not lead to better self-reported attendance or, most importantly, improved pupil learning outcomes (Méndez Vargas, 2016; Utami & Vioreza, 2021). Conversely, cost-effective interventions that have been shown to significantly decrease teacher absenteeism include in-person or technological accountability systems, supportive and competent management, and increased data tracking. When studied in India, attendance tracking systems that relied solely on self-reporting among teachers were found to be ineffective. Instead, randomised, unannounced drop-in visits and daily check-ins to monitor both attendance and curriculum progression were found to produce substantial improvement, and ultimately increased the productivity of the existing workforce (Muralidharan et al., 2017). Therefore, investing in these systems that improve visibility of stakeholder behaviour and allow policymakers to better support teachers on a national level yields increased teacher attendance, performance, and, consequently, greater returns in pupil learning outcomes.

Pupils receive significantly more high-quality instructional time than before

Throughout the first 47 weeks of RwandaEQUIP, teachers were more likely to be in school, completing high-quality lessons and using better pedagogical practices. In turn, the rate at which lessons were completed increased dramatically. In the first five weeks of RwandaEQUIP, only 17% of lessons were being delivered and completed as intended.[15] By the end of the last term of the 2022-23 school year, the lesson completion rate surged to 77% — increasing by 60 percentage points (Figure 6.18). Even pupil attendance increased from 76% to 88% over this period. Ensuring high rates of lesson completion and pupil attendance has a positive impact on the amount of high-quality instructional time that pupils receive, and thus, overall learning outcomes.

Lesson Completion Rate Since the Start of the Programme

By academic term

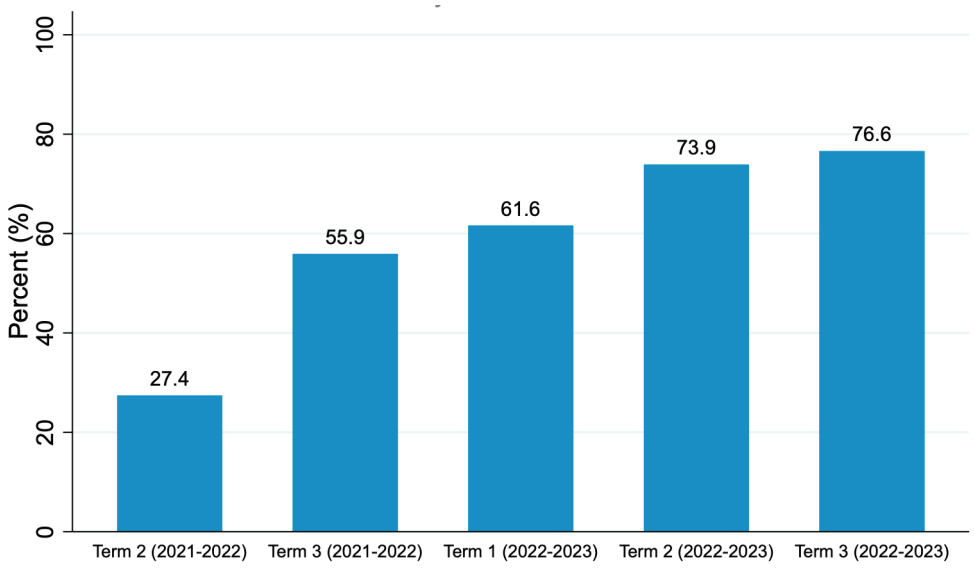


Figure 6.18

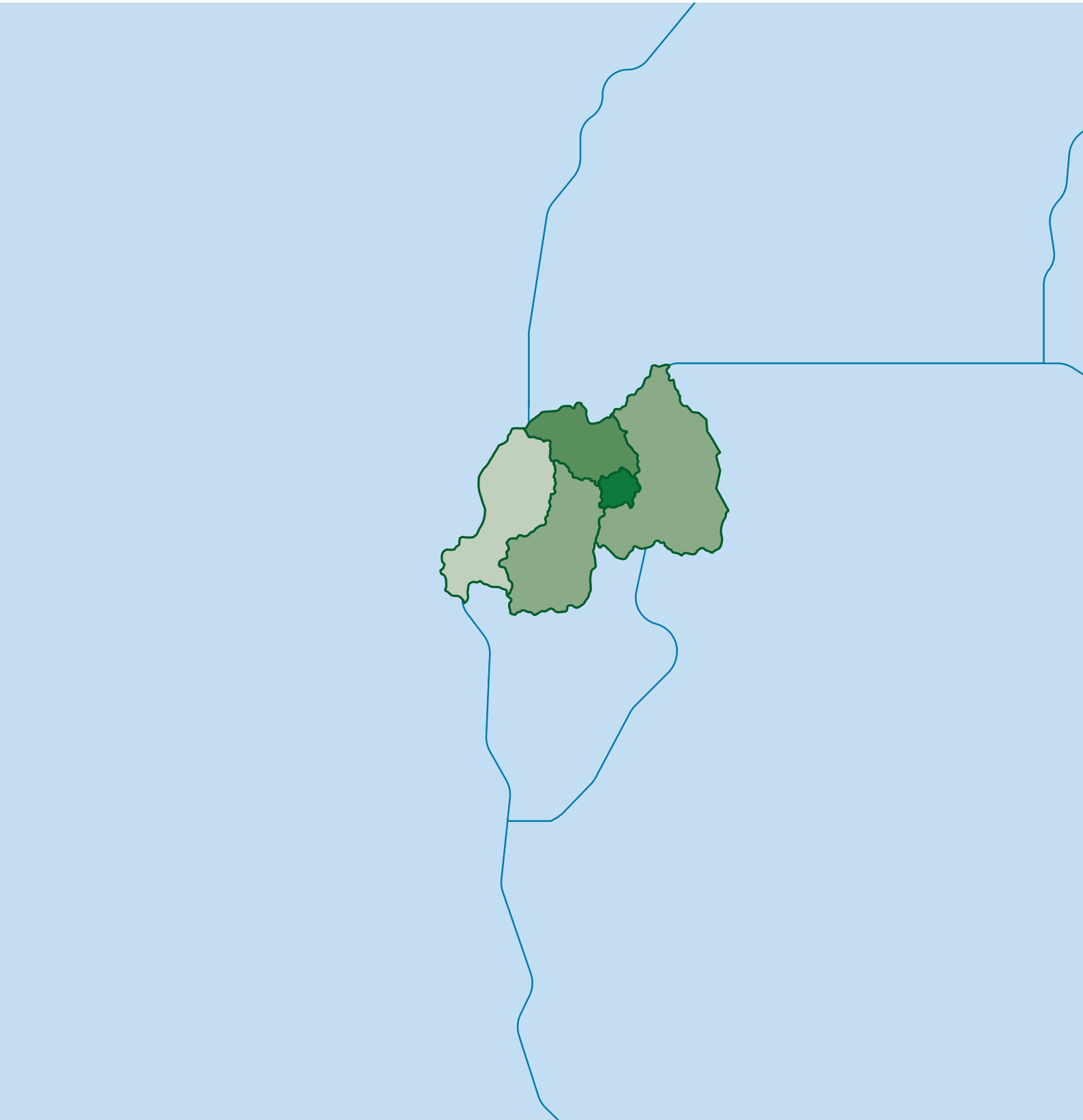
In order to quantify this improvement, one can assume that the average Rwandan school day for a single-shift school is scheduled to complete 6.7 hours of instruction per day, or 33.5 per week. As previously mentioned, at the start of the programme, only 17% of the lessons were completed and pupils would only be there 76% of the time — leading to roughly 4.3 hours of high-quality instruction delivered per week. At the end of the second school year of the programme, 77% of the lessons were successfully completed and pupils were present 88% of the time — leading to roughly 22.7 hours of high-quality instruction delivered per week to the average pupil in the programme (see Table 14 in Appendix C). **This observed increase, from 4.3 hours to 22.7 hours, indicates that the average pupil is now experiencing more than 18 additional hours of high-quality instruction each week**, which is more than 5 times that of the first five weeks of the programme. Even this estimate does not take into account two facts: 1) the transition to a single-shift classroom model, which underestimates the increase in instructional time, and 2) the fact that lessons are, qualitatively, much higher quality and better organised than before.

[15] In the first 5 weeks of Term 2 of the 2021-22 school year, the lesson completion rate was 17% (not shown in Figure 6.18), with an average lesson completion rate of 27% for the entirety of the term (as shown in Figure 6.18).

In light of these findings, the previously discussed learning gains in foundational literacy and numeracy outcomes are unsurprising. As teachers and pupils spend more time in their classrooms, the opportunities for pupils to learn are now much higher, both in terms of quantity and quality. Additionally, the provision of teacher guides and training have streamlined the lesson planning process, enabling teachers to dedicate more attention to delivering high-quality instruction rather than to exhaustive preparation. In summary, the overall improvements in attendance, lesson delivery, and instructional quality, combined with the stronger accountability mechanisms and quality of the support that teachers received, continue to improve learning outcomes while also enhancing the overall return on the Rwandan Government's existing investment in the educational system.

> "You can see even when you enter a classroom, students are more active compared to before."
>
> – Buregeya Salomon, G.S. Nyinawimana, Director of Studies

VII. Comparing the Results to Broader Educational Policy in Rwanda



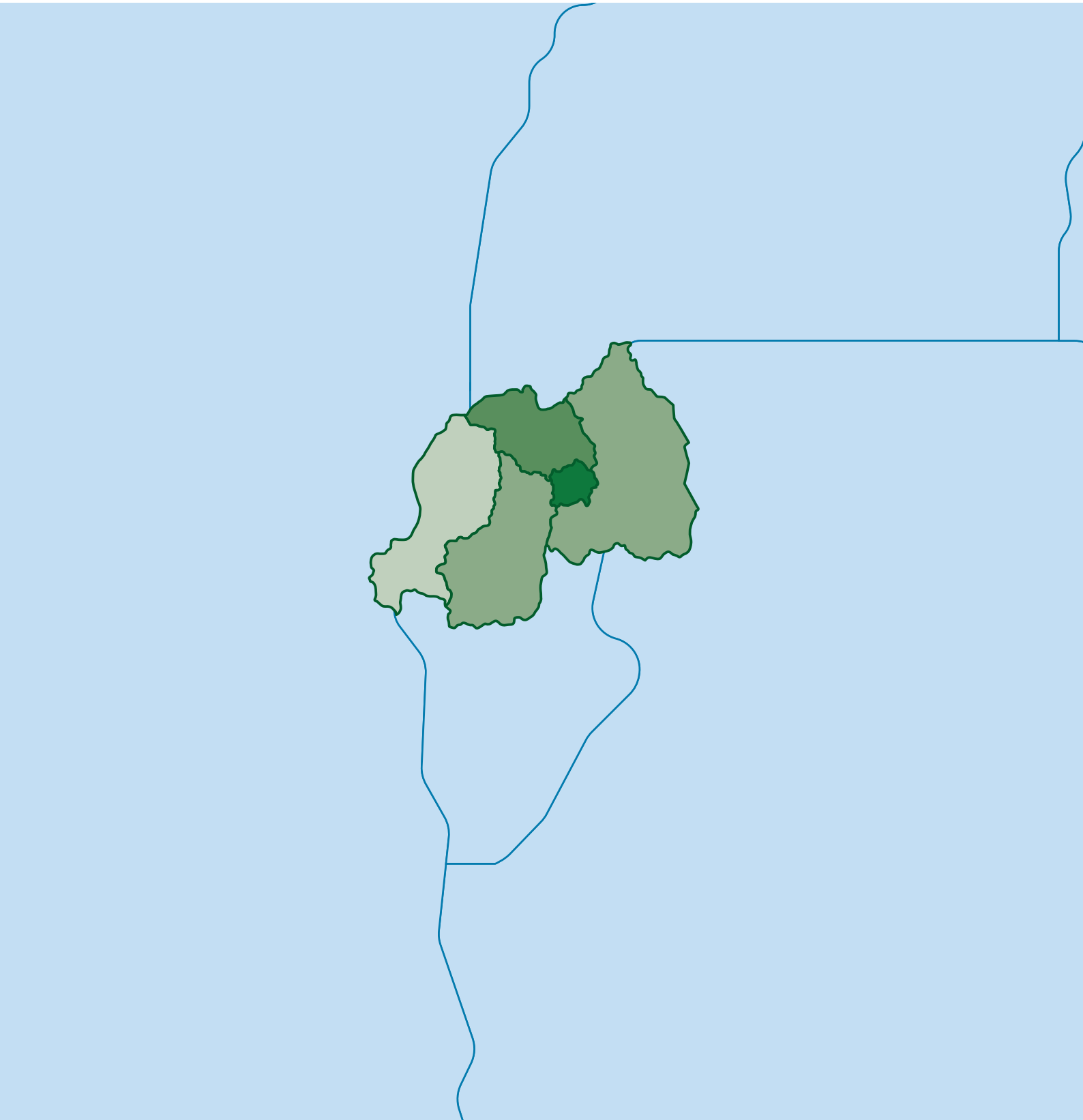
RwandaEQUIP is a government-led programme and, as such, operates within the framework of the broader education policy within the country. This section examines the larger policy landscape and motivations within Rwanda's education system, assessing the effectiveness and coherence of RwandaEQUIP in aligning with the policy goals established by the Government of Rwanda. Specifically, attention is given to the policy recommendations outlined in the 2021 report by NESA, "Learning Achievement in Rwandan Schools", which serves as a guideline for improving education in Rwanda. The table on the following page describes the extent to which RwandaEQUIP is supporting these goals.

Table 7.1: How RwandaEQUIP Aligns With National Education Objectives

	Policy Recommendations From NESA	Programme Features and Evaluation Findings
Foundational Learning and Curriculum Design	**Focus on building foundational skills in lower Primary pupils** "Put great emphasis on early grades of Primary: there is a need to focus on the learners in early grades to equip them with foundational skills. Research has shown that the knowledge not acquired in the first years of schooling cannot easily be recovered in subsequent school years." (p. 28)	In 47 weeks, RwandaEQUIP lessons have produced massive gains in foundational literacy and numeracy in Primary 1 and 2. • English: 14 percentage point average improvement in reading comprehension. • Kinyarwanda: Despite the enforcement of English as the language of instruction, fluency in Kinyarwanda increased at twice the rate of comparison schools within 17 weeks, with no subsequent losses observed after 47 weeks. • Numeracy: Improvement of 25 percentage points in level 1 addition and 17 percentage point improvement in level 2 subtraction.
	Promote gender equity in education "Gender responsive teaching and learning strategies need to be prioritised within the teacher training and continuous professional development. It is evident that there is a gender gap in all the subjects and at all levels involved in this assessment." (p. 29)	In RwandaEQUIP schools, there was a very small to negligible gender difference in pupils' performance between boys and girls at the start of the programme. More importantly, the programme worked equally well for both boys and girls upon comparison of the treatment effect for boys versus girls.
Teachers and Their Role In Policy	**Teacher motivation is key to pupils' performance** "Motivate [teachers] to concentrate on teaching and learning, which will lead to improved performance of learners." (p. 27)	Interview data collected from field visits suggest that head teachers are understanding the programme's focus on pupils at all levels of performance, that they are coaching and encouraging teachers to use the programme, and finding the structured approach helpful in supporting teachers.
	Build teachers' capacity to teach in English "There is a need to put in place a structured capacity-building plan for teachers, especially in English, which is the language of instruction." (p. 27)	RwandaEQUIP helps teachers to teach in English. The structured teacher guides allow teachers of different English levels to effectively deliver lessons of standardised quality, which produce learning gains. To quote one of the head teachers from an interview: "We have improved the language of instruction. Before we used to teach English, but still had to use Kinyarwanda to explain… Today, we use English only, and learners answer in English only."
	Reduce teachers' workloads "Review teacher workloads: The teachers urged that pupils' performance is low because they do not have time to prepare lessons… Teachers proposed to the policy makers to preserve one day per week for every teacher to allow enough time for preparation for lessons for the whole week." (p. 27)	With RwandaEQUIP's high-quality teacher guides, teachers can now shift their time spent on the burden of lesson planning and instead focus on high-quality instruction and pupil support.
	Implement Continuous Professional Development (CPD) "Teachers should be trained on topics like classroom management, specific teaching methods for the subject, etc. School leaders must put in place the continuous coaching programs of the teachers." (p. 28)	The RwandaEQUIP support systems, both formalised training and regular feedback, strengthen teacher capacity and provide a positive cycle of improvement leading to still greater motivation. For example, the STRIVE boards reinforce school-wide behavioural standards and teaching methods, increasing pupil attention. Similarly, through real time classroom observations and coaching enabled by the RwandaEQUIP ecosystem, teachers receive continuous feedback on their performance and how their instructional practices can improve even further.

	Policy Recommendations From NESA	Programme Features and Evaluation Findings
Educational Inputs	**Provide sufficient teaching and learning materials** "Provision of sufficient teaching and learning materials for all subjects, especially English learning resources for Primary schools to support the implementation of the recent language of instruction in lower Primary." (p. 27)	RwandaEQUIP's teacher guides ensure that teachers have standardised, high-quality materials to effectively teach in Kinyarwanda and in English. The creation of these teacher guides follows an evidence-based approach, the lessons are rigorously observed and iterated upon, they are integrated with existing school resources like XO laptops, REB textbooks, and RwandaEQUIP print materials, and are designed to reinforce training and CPD.
	Promote the use of technology in education "ICT in Education policy should be sustainably reinforced to expand opportunities for both learners and teachers to access resources that will promote quality teaching and learning during formal as well as informal schooling processes… This should be accompanied with strengthening the necessary infrastructure and internet connectivity that should be monitored strongly to guarantee implementation." (p. 27)	RwandaEQUIP is grounded in a technological platform that makes coherent and thoughtful use of inputs through a targeted application of technology with a clear theory of change in mind. In other words, the technology used in RwandaEQUIP is crafted to address recurring issues present before the start of the programme, like weak pedagogy and lack of accountability for teacher attendance.

VIII. Looking Ahead to the 2023-24 School Year and Beyond



After 47 weeks of programme implementation, RwandaEQUIP has gained momentum in transforming the educational landscape across the country, effectively adapting its approach to meet the specific needs of both pupils and school staff. In turn, the quality of instruction and pupil learning outcomes continue to improve year-on-year. Throughout the lifespan of the programme to date, teachers have spent more time in the classroom, using pedagogically-sound teaching methods to deliver high-quality instruction and as a result, pupils have made tremendous strides in foundational learning outcomes. For instance, the share of non-readers has drastically declined, decreasing by an average of 57 percentage points in Primary 1 and by 53 percentage points in Primary 2. Consistent with this finding, pupils also made large gains in reading comprehension — achieving scores at least three times greater than their peers in comparison schools. In maths, the average pupil improved their scores faster than pupils in non-RwandaEQUIP schools across every subskill measured by EGMA. Further, the programme increased the share of pupils meeting the grade-level benchmarks developed by NESA, with nearly twice as many pupils meeting grade-level standards in RwandaEQUIP schools than in comparison schools. These findings, among other improvements, demonstrate the positive impact of the continued educational investments made by the Rwandan Government.

As evidenced in this report, the investment thus far into the education sector in Rwanda has already yielded extremely positive results. Now, continued work is required in order to sustain these positive trends — and build upon them — in the coming years of the programme. Specifically, RwandaEQUIP is working to accelerate foundational learning in English and maths, reduce heterogeneity in learning outcomes between schools, and provide more targeted support for PLE preparation.

Implementation of the 'Achievement Plan' to Accelerate Foundational Learning in English and Maths

While significant learning progress has been achieved thus far in English and maths, we must continue working to prioritise the development and mastery of these key foundational skills. The 'Achievement Plan' is a strategy to maximise time spent on English and maths by allocating additional lessons per week to these critical subjects. In addition to increasing learning time on foundational subjects, the 'Achievement Plan' levels English and maths content using precise learning data across the programme. By matching English and maths content to pupils' current level of ability, pupils can learn at the right level, building critical foundational pre-skills. Through the additional learning time in English and maths, pupils can accelerate through instructional levels, covering more than one grade levels' worth of content. In this way, the 'Achievement Plan's' unique focus on learning time, levelling, and acceleration will move more pupils closer to grade level benchmarks within 1-2 years, given consistent programme participation.

More Precise Differentiation of English and Maths Instruction to Address Heterogeneity Between Schools

While pupils have made significant progress narrowing the gap between learning levels and grade level standards, those gaps still exist for many pupils. In order to create learning environments that are optimised for learning outcomes, instruction must continue to be delivered at the right level for pupils. The first and most important way to achieve this is to ensure that the level of English and maths instructional materials (including teacher guides and textbooks) is precisely aligned to the median pupil's learning levels, rather than simply to the grade level of the pupil (which is not necessarily an accurate predictor of learning). For the coming year, RwandaEQUIP will use item-level data on English and maths performance for every pupil across the system in order to identify the appropriate level of instruction for each grade level, and to subsequently inform the instructional materials that are provided to each teacher. In this way, the programme can dynamically respond to changes in learning levels over time as well as across grade levels, maximising the relevance of instruction for pupils.

In order to meet the learning needs of pupils across differently-performing schools, RwandaEQUIP will also employ strategies to provide even more precise and responsive differentiated instruction across the system. Specifically, performance data will be used to ensure that each school and grade across the programme receives its own customised learning programme with instructional levels that precisely match the unique learning profile of its pupils. In practice, this ensures that classrooms in higher-achieving schools are provided with more challenging content, while classrooms in lower-achieving schools receive more aligned foundational instruction that meets the needs of their pupils.

Investment in Stronger PLE Support for Primary 6 Pupils

While there has been promising growth in more foundational skills, that progress has not yet translated into sufficient improvement on the PLE among Primary 6 pupils. While it is reasonable to expect that growth in foundational skills will eventually lead to improved performance on an exam that requires mastery of those foundational skills, RwandaEQUIP must also identify more immediate opportunities to improve test performance for next year's cohort of Primary 6 pupils.

In order to improve test performance, the programme will implement a three-tiered strategy. First, pupils will continue to take mock exams during their terminal year of Primary school. These mock exams are modelled precisely on past exam papers, ensuring that the experience is representative of what pupils will encounter when they take the official exam. These mock exams offer critical opportunities for pupils to develop familiarity with the test itself, including the structure of the test, the instructions of individual sections, the types of questions that are asked, and the content that is likely to be assessed. This will result in a more comfortable and predictable experience for pupils on the actual day of the exam, reducing stress and ensuring that pupils can truly demonstrate what they have learned. In addition, the practice opportunities themselves will create important learning opportunities for pupils and teachers — including both the completion of the practice itself, and also reviewing answers and mistakes with the teacher. Finally, the data on mock exam performance will be used by programme staff in order to continue to improve the academic model, including teacher guides and professional development opportunities.

Second, pupils will continue to participate in a test preparation programme, which was custom-designed to improve performance on the PLE exam. The course will target instruction towards specific subject-level content that pupils are likely to encounter during the exam. It also provides extensive practice opportunities for pupils, with each lesson including actual test problems from past papers. These strengthen familiarity with the structure of questions, and also ensure that pupils are engaging with content from past papers that will likely reappear during future exams. The design of this course is also deeply responsive to actual pupil performance, with data from ongoing pupil assessments (including mock exams and termly assessments) informing the areas where the course invests time and instruction.

Third, pupils will receive a printed homework book that is written to provide home-based practice opportunities focused on test preparation. Activities build mastery of high-frequency content and skills that are likely to be assessed on the exam. Additionally, the practice problems are modelled based on common question structures and actual past papers, providing extensive and relevant practice opportunities. Most importantly, the provision of these books serves the dual-purpose of extending learning time while also protecting time during the day to maintain a focus on foundational skills and content mastery. This approach will further strengthen pupils' preparedness for the exam and promote success across the education system.

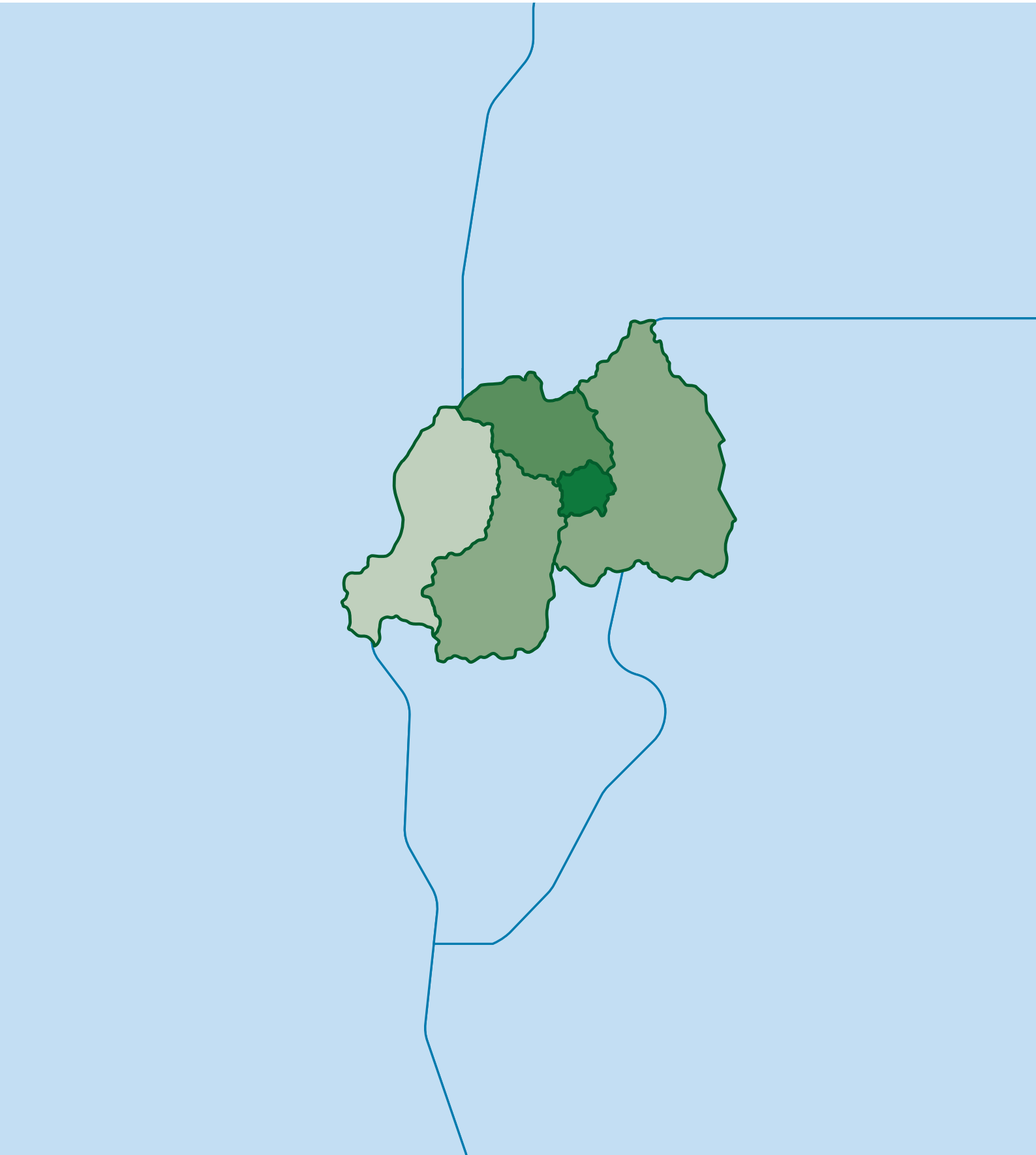
Continued Investment in Key Policy Initiatives and Programmatic Drivers

The impressive progress of RwandaEQUIP since its launch in February 2022 has validated the ongoing investments made by the Government of Rwanda in transforming its education system. The evidence in this report confirms that children who have not yet received high-quality education can quickly and significantly advance their learning when provided with the proper support. For instance, in just 47 weeks of programme implementation, the percentage of non-readers in a typical Primary 1-2 class in RwandaEQUIP schools has been cut by more than half, and English fluency rates in these classes have more than doubled compared to the growth seen in non-RwandaEQUIP schools. Moreover, RwandaEQUIP more than doubled the pace of learning in single-digit addition and subtraction for pupils in the average Primary 1 classroom. These findings, among other improvements, demonstrate the positive impact of the continued educational investments made by the Rwandan Government.

That said, despite the improvements observed by the end of the 2022–23 school year, more work is required in order to sustain, and build upon, these positive trends in the coming years of the programme. As a data-driven programme, RwandaEQUIP will continue to conduct similarly large-scale, rigorous evaluations for the upcoming school years as well. The same comparison group will be maintained to continue benchmarking learning gains throughout the duration of the programme, relative to the initial set of treatment schools, while also incorporating representative samples of the new cohorts of schools and monitoring learning gains among those schools. These rounds of data collection will give the Rwandan Government further insights into the impact of the programme: what is going well, and what needs to be strengthened. Continued investments to accelerate foundational learning in English and maths, refine instructional levelling across schools and grades, and improve pupil performance on the PLE — if done correctly — will drastically improve the quality of teaching and learning across Rwanda.

RwandaEQUIP is a bold initiative from the Government of Rwanda. During its first 47 weeks of operations, it has enabled pupils to be on faster and higher learning trajectories than what they could have expected from non-RwandaEQUIP education. The large impact on foundational literacy and numeracy outcomes —through a large-scale system-wide transformation of education —is a laudable achievement by the government. Through RwandaEQUIP, the Government of Rwanda will continue to provide rich, nurturing learning environments across the country, where pupils of all backgrounds will have the unprecedented opportunity to actually learn in school and thrive academically.

IX. Appendix



Appendix A: Fluency and Comprehension Assessments

Primary 1 English Oral Reading Passage

My name is Gisa and I live with my mother and sister.

My sister and I often help our mother with farming.

A few days ago, we were in the field when we heard something moving in a pile of leaves.

My sister is very brave and went to see what it was.

I was afraid it was going to be a snake, but it was only a lizard.

Reading Comprehension Questions

1. Who does Gisa live with? **(Answer: His mother and sister)**

2. What do Gisa and his sister help their mother with? **(Answer: Farming)**

3. What did Gisa and his sister hear? **(Answer: Something moving in a pile of leaves / a lizard moving in the leaves)**

4. Why was Gisa afraid? **(Answer: He thought it might be a snake)**

5. What made the noise in the leaves? **(Answer: A lizard)**

Primary 2 English Oral Reading Passage

My name is Ganza and I live with my mother and sister.

My sister and I often help our mother with farming.

A few days ago, we were in the field when we heard something moving in a pile of leaves.

My sister is very brave and went to see what it was.

I was afraid it was going to be a snake, but it was only a lizard.

Reading Comprehension Questions

1. Who does Ganza live with? **(Answer: His mother and sister)**

2. What do Ganza and his sister help their mother with? **(Answer: Farming)**

3. What did Gisa and his sister hear? **(Answer: Something moving in a pile of leaves / a lizard moving in the leaves)**

4. Why was Ganza afraid? **(Answer: He thought it might be a snake)**

5. What made the noise in the leaves? **(Answer: A lizard)**

Primary 1 Kinyarwanda Oral Reading Passage

Uwingabire yavuye ku isoko yikoreye amatunda.

Ageze mu rugo Gashema aramutura.

Uwingabire ahita ategura ifunguro.

Ifunguro ririmo ibinyamafufu barisha amafi.

Reading Comprehension Questions

1. Uwingabire yari avuye he? **(Answer: Yari avuye ku isoko)**

2. Yari yikoreye iki? **(Answer: Yari yikoreye amatunda)**

3. Ageze mu rugo ni nde wamutuye? **(Answer: Ni Gashema wamutuye)**

4. Uwingabire yateguye iki? **(Answer: Yateguye amafunguro)**

5. Ibinyamafufu babirisha iki? **(Answer: Babirisha amafi)**

Primary 2 Kinyarwanda Oral Reading Passage

Njyanabo ni imfura iwabo, akorera i Mugombwa.

Ababyeyi be batuye i Gihundwe ni aborozi.

Njyanabo arangwa no gukora ngo yiteze imbere.

Yakoze ibikoresho amatungo y'ababyeyi be anyweramo amazi.

Nta muntu umunnyega ahubwo agishwa inama.

Yahize abandi mu ikoranabuhanga ahembwa buri mwaka.

Reading Comprehension Questions

1. Njyanabo akorera he? **(Answer: Akorera i Mugombwa)**

2. Ababyeyi ba Njyanabo batuye he? **(Answer: Batuye i Gihundwe)**

3. Njyanabo arangwa n'iki? **(Answer: Arangwa no gukora ngo yiteze imbere)**

4. Ni iki Njyanabo yakoreye ababyeyi be? **(Answer: Yakoze ibikoresho amatungo y'ababyeyi be anyweramo amazi)**

5. Kubera iki Njyanabo ahembwa buri mwaka? **(Answer: Yahize abandi mu ikoranabuhanga)**

Primary 3 Kinyarwanda Oral Reading Passage

Kera impyisi yakundaga kwiba imineke mu nsina z'abaturanyi.

Umunsi umwe, Bakame iyisanga iri kuyirira imineke iratabaza.

Impyisi aho guhunga igahuma inarya imineke.

Bakame ikomeza gukoma akamo, inyamaswa zose zirahurura.

Impongo isiga akana kayo mu gihuru yiruka ijya gutabara.

Imbwebwe isiga ibibwana mu isenga isohoka ibwejagura iratabara.

Umusambi wari ubundikiye udushwi twawo udusiga mu cyari uratabara.

Inyoni zari mu biti ziguruka zijwigira zerekeza kwa Bakame.

Intare aho yari iri iratontoma ibwira inyamaswa kuyizanira umujura.

Zihageze zisanga impyisi iri ku rwina rw'imineke ihuma.

Nuko zirayifata ziyishyira intare ariko igenda itakamba isaba imbabazi.

Ikomeje kubogoza, zirayibabarira ariko ziyica ikiru, ziyisaba kutazongera ukundi.

Reading Comprehension Questions

1. Kera impyisi yakundaga kwiba iki? **(Answer: Yakundaga kwiba imineke)**

2. Kuki Bakame yakomye akamo? **(Answer: Yasanze impyisi irya imineke yayo)**

3. Bakame imaze gukoma akamo inyamaswa zabigenje zite? **(Answer: Inyamaswa zarahuruye)**

4. Intare yategetse ko izindi nyamaswa zikora iki? **(Answer: Yasabye izindi nyamaswa kuyizanira umujura)**

5. Ni iki izindi nyamaswa zasabye impyisi zimaze kuyibabarira? **(Answer: Zayisabye kutazongera ukundi)**

Teacher English Fluency Assessment

Your Nervous System

Every day you use your brain to think and to solve problems, but did you know that your brain is constantly doing jobs you never even think about? Your brain makes sense of everything your body experiences. It also directs everything your body does. The brain is part of your nervous system, which also contains your spinal cord and your nerves. This system allows messages to be sent back and forth between the brain and other parts of your body.

Your brain is at the top of your nervous system. It is very soft, and is protected by the hard bones of your head. Connected to your brain is your spinal cord, a long bundle of nerve tissue. It threads through your spine and then branches out to connect to other nerves in your body.

The nerve cells are shaped like long, thin threads. They line up end to end and extend from the spinal cord in your back to every part of your body. The nerve endings in your skin and organs are activated by touch and other sensations. The nerve endings pass the message to the next nerve in line. In a flash, the message is relayed from nerve to nerve until it reaches your brain.

The message gives your brain information about what you are touching or sensing. The brain sends back a command telling your body what action to take. If the feeling is harmful, the brain may direct your hand to pull back. If dust blows into your eye, your brain gets the message and instantly directs your eye to blink.

Different parts of the brain handle messages of different kinds. Some parts of your brain control automatic activities in your body, such as your heartbeat and breathing. Other parts direct movement and balance. The front part of your brain thinks and holds memories. It also receives information from your five senses.

Teacher English Listening and Speaking Assessment Stimulus

PRACTICE. What is the best response?

A. I enjoy reading.
B. I am excited for supper.
C. I will buy two loaves of bread.
D. It is sunny and warm.

PROMPT 1. What is the best response?

A. My brother always wears my clothes.
B. I feel this is too smart for the occasion.
C. I bought it in a shop last week.
D. I haven't worn this in a while.

PROMPT 2. What is the best response?

A. My brother just turned five, too.
B. Haven't I told you that I only have a sister?
C. I know what you mean; mine drives me crazy.
D. I told my mom not to let him come into my room.

PROMPT 3. What is the best response?

A. I cook quite often.
B. Please help yourself.
C. I'll see if I can get it for you.
D. You'll never guess.

PROMPT 4. What is the best response?

A. Where are you taking him?
B. Of course, I'd love to.
C. I already fed him today.
D. I used to have a cat.

PROMPT 5. What is the best response?

A. That jacket looks too tight on you.
B. I'm not sure my sister would like that style.
C. I bought it online because it was cheaper.
D. Better make up your mind before that store closes.

PROMPT 6. What is the best response?

A. Yes, would you like something to eat?
B. Isn't it warm to put the heater on?
C. When is it going to be ready?
D. Don't make it too hot, OK?

PROMPT 7. What is the best response?

A. Have you taken anything for it?
B. For how long will you be away?
C. I wish he would leave you alone.
D. Stop making so much noise.

PROMPT 8. What is the best response?

A. It looks like it's going to rain any minute.
B. Sure, let me grab my jacket because it's chilly outside.
C. Let's wait until the sun goes down in an hour or so.
D. Astronomy is not my expertise, so I'm not sure.

PROMPT 9. What is the best response?

A. He has enough credits to graduate as a French major.
B. His teacher recommended me for this course.
C. I need to take one more class to fulfil my requirements.
D. I had a terrible experience with him last term.

PROMPT 10. What is the best response?

A. I wanted to call you, but my phone battery died on me right before I made a call.
B. I already left her a message saying you won't be home until late tonight.
C. She is a responsible girl, so she will contact you if she feels she needs to.
D. She does have a habit of getting up late on weekends.

Teacher English Listening and Speaking Assessment Rubric

Examiner script

I will read 10 prompts out loud. Listen carefully as I read each prompt twice. After each prompt, you will have 5 seconds to say your answer out loud. You do not need to write or circle your response. Select your answer from the list of 4 possible responses for each prompt.

We will begin with a Practice question. Point to the 4 possible responses under 'PRACTICE'. [Scan to ensure the teacher is pointing at the four responses under 'PRACTICE'] **You will say the correct response after you listen to my practice prompt. Ready? Let's begin the practice prompt.**

Practice. What is the weather like today? What is the weather like today? [Pause for 5 seconds while the teacher responds with the correct answer - 'D. It is sunny and warm'.]

In the Practice, I read the prompt twice. The prompt was ''What is the weather like today." Then, I paused to allow you to answer with the correct response. You should say the correct response out loud. The four possible responses are: (A) I enjoy reading; (B) I am excited for supper; (C) I will buy two loaves of bread; (D) It is sunny and warm. The correct response was (D) It is sunny and warm. You should read the correct response aloud after each of my prompts.

Ready? Let's begin the real assessment. (Point to Prompt 1) [Scan to ensure that the teacher is pointing to Prompt 1]

Prompt	Correct Answer + Score (Mark "X" in the given space)	
1. Read aloud: **"Prompt 1. Where did you get your shirt from?"**	**Answer:** C. I bought it in a shop last week	
		CORRECT
		INCORRECT
		NO RESPONSE
2. Read aloud: **"Prompt 2. My brother is so annoying."**	**Answer:** C. I know what you mean; mine drives me crazy.	
		CORRECT
		INCORRECT
		NO RESPONSE
3. Read aloud: **"Prompt 3. Mmm. That's delicious. What's in it?"**	**Answer:** D. You'll never guess.	
		CORRECT
		INCORRECT
		NO RESPONSE
4. Read aloud: **"Prompt 4. I don't suppose you could feed my cat this weekend, could you?"**	**Answer:** B. Of course, I'd love to.	
		CORRECT
		INCORRECT
		NO RESPONSE
5. Read aloud: **"Prompt 5. I can't decide which jacket to buy for my sister."**	**Answer:** D. Better make up your mind before that store closes.	
		CORRECT
		INCORRECT
		NO RESPONSE

Prompt	Correct Answer + Score (Mark "X" in the given space)
6. Read aloud: **"Prompt 6. Are you cooking dinner?"**	**Answer:** A. Yes, would you like something to eat? **CORRECT** **INCORRECT** **NO RESPONSE**
7. Read aloud: **"Prompt 7. I've got a pounding headache that won't go away."**	**Answer:** A. Have you taken anything for it? **CORRECT** **INCORRECT** **NO RESPONSE**
8. Read aloud: **"Prompt 8. Let's go outside and check out the beautiful moonlight."**	**Answer:** B. Sure, let me grab my jacket because it's chilly outside. **CORRECT** **INCORRECT** **NO RESPONSE**
9. Read aloud: **"Prompt 9. I wouldn't have taken French if I had known he was the teacher."**	**Answer:** D. I had a terrible experience with him last term. **CORRECT** **INCORRECT** **NO RESPONSE**
10. Read aloud: **"Prompt 10. I wish my daughter would give me a call when she is going to come home late."**	**Answer:** C. She is a responsible girl, so she will contact you if she feels she needs to. **CORRECT** **INCORRECT** **NO RESPONSE**
Total Score	**[_____] / 10**

Appendix B: EGRA and EGMA Subskill and Subtest Descriptions

The following subskill and subtest definitions are from the EGRA and EGMA Toolkits, authored by RTI International, and designed to inform proctors how to properly administer the assessment (RTI International, 2014; RTI International, 2016).

EGMA Assessed Subskills	
Subtest	**Definition**
Number Identification	The number identification test is timed (60 seconds) with no stop rules, and it consists of 20 items that increase in difficulty. The first three items of the subtest include the numerals 0,9, and one other single digit number. The next 12 items consist of two-digit numbers from 10 to 99, and the last five items are three-digit numbers from 100 to 999. Pupils are asked to say each number aloud.
Number Discrimination	The number discrimination subtest is an untimed test of 10 items with a stop rule after four successive errors. Each item consists of a set of two numbers, one of which is greater than the other. The first item is a set of one-digit numbers, the next five items are sets of two-digit numbers, and the last four items are a set of three-digit numbers. Pupils state the higher of each set of two numbers (pointing at the correct number is insufficient evidence for scoring).
Number Pattern Identification	Proficiency in number pattern identification is measured using the Missing Number subtest. The ability to detect number patterns is an important early skill that can support later mathematical skills such as multiplication and algebra. The Missing Number subtest is an untimed test of 10 items with a stop rule after four successive errors. The items are presented as four horizontally aligned boxes, three of which contain numbers and one of which is empty (the target missing number). Eight of the items increase in number from left to right; two of the items decrease in number from left to right. Items 1,2, and 6 increase by one (in a set of one-, two-, and three-digit numbers, respectively). Items 3, 4, 5, and 8 increase by tens, hundreds, twos, and fives, respectively. Items 7 and 9 decrease by twos and tens, respectively. The last item with numerals within the range of 1-20 increases by fives, but does not begin with a multiple of five. Pupils are asked to state the number that belongs in the empty box.
Addition and Subtraction	The Addition and Subtraction Level 1 subtests are timed tests (60 seconds) consisting of 20 items each that increase in difficulty. No addends are greater than 10, and no sums are greater than 19. The subtraction problems are the inverse of the addition problems. Three of the items mirror three of the Word Problems items. Assessors also keep track of whether the pupil used one of three problem-solving strategies: finger/tick marks, paper and pencil calculation, or mental arithmetic. The Addition and Subtraction Level 2 subtests are untimed tests consisting of five items each that increase in difficulty, with a stop rule of four successive errors. Addition Level 2 is not given to pupils who receive a score of zero for Addition Level 1, and Subtraction Level 2 is not given to pupils who receive a score of zero for Subtraction Level 1. No sums are greater than 70. The subtraction problems are the inverse of the addition problems.
Word Problems	The purpose for learning mathematics is to solve real-world problems, which are rarely, if ever, presented as stand-alone equations. Instead, they require interpretation of a problem and an understanding of the operations required to solve that problem. Word problems mimic, in a rudimentary way, these real-world situations. The World Problem subtest is an untimed test consisting of six items each that increase in difficulty, with a stop rule of four successive errors. Three of these items use numbers that match three items from the Addition and Subtraction Level 1 subtest. Assessors also keep track of whether the pupil used one of three problem-solving strategies: finger/tick marks, paper and pencil calculation, or solved problem in his or her head. Pupils are also provided with counters that can be used to solve the problem.

EGRA Assessed Subskills	
Subskill	**Definition**
Orientation to Print	The orientation to print sub-task is a measure of concepts of print. It is considered one of the lowest order skills pupils develop as they begin to learn to read. The sub-task is administered by asking pupils questions such as how to hold a book or where the text begins.
Letter Names	The letter names sub-task tests pupils' ability to recognise letters and accurately speak their corresponding name. The pupils are presented with a grid listing letters in a random order. Pupils are asked to read out loud as many as they can, as quickly and carefully as they can, in 1 minute. The EGRA administrator times the child, making note of any mistakes the child makes while calling out the letter names. The score is typically reported as correct letters per minute (clpm).
Initial Sound Identification	The initial sound sub-task is a measure of a pupil's ability to identify the first sound in a word. It also measures a pupil's ability to separate words into sounds and to manipulate those sounds. Pupils are told a word verbally and asked to isolate and pronounce the first sound of the word (the initial sound). The EGRA administrator records the number of correct letter sounds identified.
Phonemic Awareness	The letter sounds sub-task tests pupils' ability to recognise letters and speak their corresponding sounds. Pupils are presented with a sheet listing letters and asked to read out loud as many as they can, as quickly and carefully as they can, in 1 minute. (In some languages, graphemes, or sets of letters and/or symbols representing a single sound, are presented, e.g., in French, "é" is presented separately from "e.") The EGRA administrator times the child and records the number of correct letter sounds per minute (clspm).
Non-familiar Words	The nonword sub-task tests pupils' skill in using letter-sound connections to figure out ("decode") words. While many pupils learn to memorise a broad range of "sight" words, they need skills to decode less familiar words. In this sub-task, pupils are given a list of made-up words that do not exist in the language tested and asked to read out loud as many as they can, as quickly and carefully as they can. The EGRA administrator times the pupil and records the number of correct words per minute (cnwpm).
Familiar Words	The familiar word reading sub-task is similar in format to the nonword reading subt-ask except that it presents the pupil with a grid containing words they are expected to be able to read at their grade level and have likely encountered before. The pupils are instructed to read aloud as many words as they can in 1 minute. The EGRA administrator times the pupil, making note of any mistakes the pupil makes while reading the words aloud. The score is reported as correct words per minute (cwpm).
Oral Vocabulary	Vocabulary is words and their meanings; this sub-task measures what words pupils know. Research suggests children need to understand at least 90% of the vocabulary in a passage for comprehension to occur. In this sub-task, the EGRA administrator speaks words aloud and asks the pupil to "point" to what they mean (e.g., a body part, a simple object). The administrator records the number of vocabulary words the pupil got correct, with no time limit.
Listening Comprehension	Listening comprehension is a measure of pupils' oral language skills, which also contribute to reading. In this sub-task, the EGRA administrator reads a passage to the pupil, who does not see it. The pupil then responds to questions or statements read by the EGRA administrator.
Reading Fluency (cwpm)	The oral reading fluency (ORF) sub-task measures how quickly and accurately a pupil can read. It is a core component of EGRA because it brings together lower-level reading skills (such as decoding and familiar word recognition) with how quickly and easily the pupil can read a given word (called automaticity). Pupils are given a short, written passage on a topic that is familiar to them. They are asked to read it out loud "quickly but carefully" and are given 60 seconds from when they begin to read. The EGRA administrator times the pupil, making note of any mistakes the pupil makes while reading the words aloud. The score is reported as correct words per minute (cwpm).
Reading Comprehension	Comprehension is the main goal of reading — understanding what is read. Comprehension is a complex task that requires some ability in all other reading skills. This sub-task is paired with the ORF sub-task. Depending on how much of the ORF passage the pupil was able to read, the EGRA administrator asks the pupil up to five questions about the story. The EGRA administrator keeps track of the number of questions answered correctly.

Appendix C: Tables

Table 1: Characteristics of Different Groups of Schools - Phase 1 Schools

	Census schools (all 299 schools)	RwandaEQUIP schools (100 schools)	Treatment schools selected (30 schools)	Comparison schools selected (30 schools)	100 RwandaEQUIP schools (30 schools)	Difference between Treatment–Comparison in 30v30
Population count in 5-km radius around school	102999	94906	102147	103395	10343.5	-1248.6
					(25436.8)	(23633.0)
Population 5-14 count in 5-km radius around school	24479	22794	24296	25034	2145.1	-738.2
					(4959.8)	(4996.1)
Population density in 5-km radius around school	1311	1208	1301	1317	131.6	-15.9
					(323.9)	(300.9)
School is in Eastern province	0.19	0.21	0.27	0.27	0.08	0.00
					(0.09)	(0.00)
School is in Kigali	0.23	0.19	0.17	0.17	-0.03	0.00
					(0.08)	(0.00)
School is in Northern province	0.17	0.17	0.2	0.2	0.04	0.00
					(0.09)	(0.00)
School is in Southern province	0.2	0.15	0.17	0.17	0.02	0.00
					(0.08)	(0.00)
School is in Western province	0.21	0.28	0.2	0.2	-0.11	0.00
					(0.09)	(0.00)
ECD is currently available	0.77	0.84	0.83	0.9	-0.01	-0.07
					(0.08)	(0.08)
School has internet connectivity	0.92	0.99	0.97	1.00	-0.03	-0.03
					(0.03)	(0.03)
Total pupils according to SDMS	1423.3	1334.8	1353.3	1309.6	26.43	43.73
					(75.29)	(82.82)
Total pupils in ECD, according to census	72.8	88.2	79.8	84.5	-11.95	-4.67
					(12.64)	(11.24)

	Census schools (all 299 schools)	RwandaEQUIP schools (100 schools)	Treatment schools selected (30 schools)	Comparison schools selected (30 schools)	100 RwandaEQUIP schools (30 schools)	Difference between Treatment–Comparison in 30v30
Total pupils in Primary, according to census	1207.2	1090.7	1123.8	1131.2	47.55	-7.4
					(65.04)	(72.96)
Total number of teachers, according to census	26.4	26.7	26.7	25.9	-0.05	0.80
					(1.35)	(1.57)
School-level pupil-teacher ratio	54.6	50.4	51.2	51.6	1.11	-0.42
					(1.81)	(2.43)
Share of teachers at 80 cwpm or higher	67.2	75.5	71.1	70.7	-6.37***	0.41
					(1.86)	(2.32)
School-level passing rate of PLE 2020	83.2	81.7	83.6	81.8	2.73	2.22
					(2.72)	(3.09)
Estimated number of classrooms at the school	23.2	24.4	23.8	23.4	-0.87	0.40
					(1.12)	(1.24)
Average number of math textbooks per pupil in P2-P6	0.44	0.47	0.49	0.54	0.03	-0.05
					(0.12)	(0.17)
Observations	299	100	60	239	100	60

Notes: The number of observations refers to the number of schools in each category, but the actual number of observations in each cell may vary depending on missingness for each variable. The differences between the RwandaEQUIP schools and the 30v30 schools are calculated in a regression adjusted framework. The difference between treatment and comparison schools is also calculated in a regression-adjusted framework, and includes fixed-effects for each randomisation pair, akin to controlling for stratification strata. The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01.

Table 2: Comparison of 30 Phase 1 RwandaEQUIP Schools vs. 30 Phase 1 Comparison Schools

Baseline characteristics		Comparison schools	Treatment schools
Community, school, and teacher characteristics	Population density in 5-km radius	1316.5	1300.6
		(1694.8)	(1507)
	School is in urban area	20.0%	23.3%
		(0.4)	(0.4)
	Total number of pupils (according to SDSM)	1309.6	1353.3
		(270.2)	(342.9)
	Number of teachers (according to census)	25.9	26.7
		(5.8)	(6)
	Pupil-teacher ratio	51.6	51.2
		(9.8)	(8.4)
	Average teacher English fluency (cwpm)	94.9	95.2
		(8.2)	(5.9)
	PLE passing rate	81.7%	83.6%
		(0.1)	(0.1)
	Number of usable classrooms	17.7	19.7
		(5.8)	(5.8)
	School has internet connectivity	100.0%	96.7%
		-	(0.2)
Kinyarwanda achievement	Writing assessment (% correct) (P1-P2)	26.1%	23.9%
		(0.3)	(0.3)
	Reading fluency (correct words per minute) (P1-P3)	15.6	15.9
		(17.2)	(17.2)
	Reading comprehension (% correct) (P1-P3)	35.6%	34.8%
		(0.4)	(0.4)
English achievement	Letter names (number correct) (Nursery-P2)	2.2	1.5
		(6.0)	(4.2)
	Reading fluency (correct words per minute) (P1-P2)	2.0	1.8
		(4.8)	(5.6)
	Reading comprehension (% correct) (P1-P2)	0.6%	0.6%
		(0.0)	(0.0)
Numeracy achievement	Addition problems - level 1 (number correct) (Nursery-P2)	2.8	2.7
		(3.3)	(3.7)
	Subtraction problems - level 1 (number correct) (Nursery-P2)	2.0	2.2
		(3.1)	(2.9)
	% Multiplication problems correct (% correct) (P2)	19.6%	18.9%
		(0.2)	(0.2)

Table 3: Detailed Results (EGRA) - Terms 2-3 of 2021-22 School Year (Phase 1 Schools)

	All		Nursery 3		Primary 1		Primary 2	
	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect
All outcomes (standardised across rounds)	-0.17	0.39***	-0.12	0.37***	-0.22	0.46***	-0.16	0.36***
	(0.85)	(0.11)	(0.87)	(0.14)	(0.80)	(0.14)	(0.88)	(0.13)
Print orientation (%)	0.59	0.12**	0.45	0.18**	0.59	0.08	0.71	0.12*
	(0.39)	(0.05)	(0.39)	(0.08)	(0.39)	(0.07)	(0.35)	(0.07)
Listening comprehension (%)	0.35	0.16**	0.36	0.21***	0.32	0.15*	0.38	0.11
	(0.36)	(0.07)	(0.35)	(0.07)	(0.36)	(0.08)	(0.35)	(0.08)
Initial sound identification (%)	0.35	0.14**	0.25	0.06	0.32	0.19**	0.46	0.15
	(0.35)	(0.07)	(0.28)	(0.07)	(0.34)	(0.08)	(0.37)	(0.1)
Phonemic awareness (%)	0.22	0.16***	0.15	0.07	0.17	0.24***	0.32	0.16*
	(0.27)	(0.05)	(0.21)	(0.05)	(0.24)	(0.07)	(0.31)	(0.08)
Oral vocabulary (%)	0.36	0.1***	0.28	0.11***	0.36	0.11**	0.42	0.1**
	(0.2)	(0.03)	(0.19)	(0.04)	(0.2)	(0.05)	(0.19)	(0.04)
Letter names (#)	7.19	4.42	3.16	2.91	6.81	7.3*	11.21	2.80
	(12.28)	(3.17)	(8.25)	(2.67)	(11.67)	(3.91)	(14.47)	(4.06)
Non-familiar words (#)	4.40	4.71**	-	-	-	7.3*	4.40	4.71**
	(7.23)	(2.01)	-	-	-	(3.91)	(7.23)	(2.01)
Familiar words (#)	4.23	4.35**	-	-	2.44	4.2**	5.99	4.39**
	(7.03)	(1.66)	-	-	(5.64)	(1.74)	(7.78)	(1.93)
Reading fluency (cwpm)	6.99	4.81*	-	-	4.28	5.78**	9.43	4.06
	(10.75)	(2.5)	-	-	(10.47)	(2.77)	(10.42)	(2.71)
Reading comprehension (%)	0.06	0.09***	-	-	0.04	0.12***	0.12	0.13**
	(0.16)	(0.03)	-	-	(0.13)	(0.04)	(0.22)	(0.06)
Proficiency	0.29	0.18**	0.29	0.27***	0.23	0.25**	0.36	0.05
	(0.46)	(0.07)	(0.45)	(0.08)	(0.42)	(0.1)	(0.48)	(0.09)

Notes: The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01.

Table 4: Detailed Results (LEGRA) - Terms 2-3 of 2021-22 School Year (Phase 1 Schools)

	All		Primary 1		Primary 2		Primary 3	
	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect
All outcomes (standardised across rounds)	-0.07	0.33***	-0.04	0.34**	-0.05	0.24*	-0.12	0.44***
	(0.96)	(0.11)	(0.98)	(0.17)	(0.96)	(0.13)	(0.94)	(0.14)
Understanding words (%)	0.80	0.07	0.79	0.10	0.82	0.04	-	-
	(0.26)	(0.06)	(0.27)	(0.07)	(0.24)	(0.06)	-	-
Writing (%)	0.66	0.07	0.68	0.11	0.64	0.04	-	-
	(0.34)	(0.06)	(0.34)	(0.07)	(0.33)	(0.06)	-	-
Reading fluency (cwpm)	23.62	8.92**	11.04	3.30	21.11	3.94	38.94	19.61**
	(23.87)	(3.69)	(11.28)	(2.82)	(17.49)	(3.39)	(29.69)	(7.62)
Reading comprehension (%)	0.60	0.12**	0.61	0.14*	0.49	0.16**	0.70	0.06
	(0.34)	(0.06)	(0.36)	(0.07)	(0.35)	(0.08)	(0.29)	(0.07)
General language (%)	0.59	0.19***	-	-	-	-	0.59	0.19***
	(0.28)	(0.05)	-	-	-	-	(0.28)	(0.05)
Proficiency (%)	0.33	0.21***	0.42	0.25***	0.24	0.19**	0.34	0.21**
	(0.47)	(0.07)	(0.49)	(0.08)	(0.43)	(0.08)	(0.47)	(0.09)

Notes: The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01.

Table 5: Detailed Results (EGMA) - Terms 2-3 of 2021-22 School Year (Phase 1 Schools)

	All		Nursery 3		Primary 1		Primary 2	
	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect	Comparison schools at end of '21-22 school year mean/SD	Treatment effect
All outcomes (standardised across rounds)	-0.22	0.39***	-0.26	0.46***	-0.19	0.34***	-0.22	0.42***
	(0.83)	(0.10)	(0.82)	(0.12)	(0.83)	(0.12)	(0.85)	(0.12)
Counting circles (%)	0.79	0.07*	0.67	0.16***	0.90	-0.01	-	-
	(0.26)	(0.04)	(0.28)	(0.05)	(0.18)	(0.04)	-	-
Number identification (%)	0.33	0.22***	0.21	0.23***	0.31	0.24***	0.45	0.24***
	(0.29)	(0.04)	(0.25)	(0.06)	(0.27)	(0.06)	(0.29)	(0.06)
Number discrimination (%)	0.14	0.02	0.09	0.03	0.14	0.02	0.17	0.02
	(0.08)	(0.01)	(0.08)	(0.02)	(0.08)	(0.02)	(0.08)	(0.02)
Missing number identification (%)	0.20	0.07**	0.12	0.08**	0.19	0.09**	0.25	0.06*
	(0.17)	(0.03)	(0.14)	(0.04)	(0.15)	(0.04)	(0.18)	(0.03)
Word problems (%)	0.24	0.09*	0.13	0.12**	0.26	0.04	0.30	0.11*
	(0.28)	(0.05)	(0.21)	(0.05)	(0.28)	(0.06)	(0.31)	(0.07)
Addition - L1 (%)	0.23	0.19***	0.16	0.22***	0.21	0.19***	0.30	0.19***
	(0.2)	(0.04)	(0.2)	(0.05)	(0.18)	(0.05)	(0.19)	(0.05)
Addition - L1 (#)	4.10	3.13***	1.58	2.21***	4.19	3.87***	6.02	3.74***
	(3.78)	(0.74)	(2.03)	(0.52)	(3.58)	(1.06)	(3.87)	(1.01)
Addition - L2 (%)	0.11	0.06	0.00	0	0.12	0.08	0.18	0.11*
	(0.22)	(0.04)	(0)	(0)	(0.23)	(0.06)	(0.26)	(0.07)
Addition - L2 (#)	1.35	1.13***	-	-	1.11	0.88**	1.56	1.23***
	(1.39)	(0.3)	-	-	(1.34)	(0.35)	(1.39)	(0.4)
Subtraction - L1 (%)	0.19	0.17***	0.13	0.14**	0.17	0.2***	0.26	0.2***
	(0.19)	(0.04)	(0.2)	(0.05)	(0.17)	(0.05)	(0.19)	(0.05)
Subtraction - L1 (#)	3.42	3.06***	1.27	1.4**	3.37	4***	5.19	4.02***
	(3.6)	(0.71)	(1.99)	(0.53)	(3.35)	(0.94)	(3.85)	(0.98)
Subtraction - L2 (%)	0.09	0.06*	0.00	0	0.10	0.1*	0.16	0.10
	(0.2)	(0.04)	(0)	(0)	(0.19)	(0.05)	(0.24)	(0.06)
Subtraction - L2 (#)	1.22	1.13***	-	-	0.98	1**	1.41	1.09**
	(1.27)	(0.35)	-	-	(1.18)	(0.45)	(1.32)	(0.45)
Multiplication (%)	0.33	0.09	-	-	-	-	0.33	0.09
	(0.27)	(0.08)	-	-	-	-	(0.27)	(0.08)
Division (%)	0.28	0.12	-	-	-	-	0.28	0.12
	(0.26)	(0.09)	-	-	-	-	(0.26)	(0.09)
Shape recognition (%)	0.28	0.01	0.24	0.04	0.16	-0.01	0.43	0.03
	(0.2)	(0.03)	(0.14)	(0.03)	(0.12)	(0.04)	(0.22)	(0.05)
Proficiency (%)	0.03	0.1***	0.00	0	0.02	0.14***	0.07	0.16***
	(0.18)	(0.03)	(0)	(0)	(0.14)	(0.04)	(0.25)	(0.06)

Notes: The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01.

Table 6: Programme Effect on Teacher Practices After 17 Weeks (In SD Units)

Subskill	Full Sample	Lower Primary	Upper Primary
Q1: Time pupils spend on learning	0.17	0.17	-0.18
	(0.14)	(0.15)	(0.3)
Q2: Supportive learning environment	0.16	0.19	-0.11
	(0.18)	(0.19)	(0.31)
Q3: Positive behavioural expectation for pupils	0.38**	0.39**	-0.28
	(0.17)	(0.19)	(0.69)
Q4: Lesson facilitation	0.22	0.22	0.22
	(0.17)	(0.19)	(0.39)
Q5: Monitor pupils' learning progress	0.26	0.26	0.17
	(0.17)	(0.19)	(0.47)
Q6: Provide feedback to pupils	0.24	0.21	0.21
	(0.17)	(0.2)	(0.3)
Q7: Encourage pupils' critical thinking	0.19	0.22	-0.16
	(0.17)	(0.19)	(0.39)
Q8: Promote autonomy in classrooms	0.18	0.17	0.23
	(0.14)	(0.17)	(0.34)
Q9: Encourage perseverance	0.36**	0.42**	0.04
	(0.17)	(0.18)	(0.41)
Q10: Promote pupils' social and collaborative skills	0.14	0.13	-0.10
	(0.19)	(0.21)	(0.36)
Q11: Teacher is actively leading	0.03	0.02	-0.32
	(0.07)	(0.08)	(0.26)
Q12: Enough materials for all pupils	0.00	-0.12	0.46*
	(0.13)	(0.14)	(0.24)
Q13: Motivate pupils	0.50	0.62	-1.74*
	(0.54)	(0.58)	(0.95)
Q14: Accurate lesson plan	0.87	1.09	-2.26
	(0.73)	(0.79)	(1.43)
Q15: Check pupil performance	0.68	0.85	-2.94*
	(0.55)	(0.59)	(1.5)
Q16: Respond to pupils	0.83	0.82	-0.97
	(0.54)	(0.59)	(1.44)
Q17: Help pupils to learn	-	-	-
	-	-	-

Notes: The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01. There was no variation from baseline to the end of the 2021-22 year for Q17 - all teachers answered yes at both rounds.

Table 7: Provincial Differences in Learning Outcomes After 17 Weeks, By Assessment and Subskill

			Province				
Assessment	**Subskill**	**All**	**Kigali**	**East**	**West**	**North**	**South**
EGRA	Proficiency	0.18**	-0.04	0.21	0.17	0.23*	0.26
		(0.07)	(0.16)	(0.13)	(0.15)	(0.12)	(0.18)
	Reading fluency	4.83*	1.1	4.39	2.69	8.41**	6.13
		(2.55)	(2.82)	(4.73)	(3.20)	(3.73)	(9.08)
	Reading comprehension	0.09***	0.07	0.01	0.05	0.22***	0.09
		(0.03)	(0.05)	(0.05)	(0.05)	(0.06)	(0.10)
EGMA	Proficiency	0.10***	0.07*	0.03	0.19**	0.17	0.23**
		(0.03)	(0.04)	(0.05)	(0.07)	(0.05)	(0.09)
	Level 1 addition	3.07***	0.24	2.78*	4.82**	1.47	6.19**
		(0.73)	(0.78)	(1.34)	(1.71)	(0.94)	(2.54)
	Level 1 subtraction	3.00***	0.71	2.34	5.35***	1.51*	5.48**
		(0.68)	(0.77)	(1.42)	(1.62)	(0.83)	(2.21)
LEGRA	Proficiency	0.21**	0.23	0.24*	0.06	0.14	0.41**
		(0.06)	(0.23)	(0.11)	(0.15)	(0.08)	(0.14)
	Reading fluency	8.92**	12.38	7.11	4.52	2.65	20.38**
		(3.63)	(10.05)	(6.91)	(8.33)	(3.67)	(10.03)
	Sample size	60	10	16	12	12	10

Notes: The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01.

Table 8: Class Size Differences in Learning Outcomes After 17 Weeks, By Assessment, Subskill, and Grade

Assessment	Subskill	Grade	Baseline		Interaction effect
			Large class size (mean and standard deviation)	Difference large–small class size	Small class size * treatment effect
EGRA	Proficiency	P1	0.01	0.07**	0.1
			(0.1)	(0.03)	(0.2)
		P2	0.09	-0.02	-0.05
			(0.28)	(0.03)	(0.19)
	Reading fluency	P1	0.15	0.4**	-5.87
			(0.07)	(0.18)	(5.35)
		P2	2.35	0.33	-0.37
			(4.58)	(0.62)	(5.52)
	Reading comprehension	P1	0	0	-0.11
			(0.01)	(0.00)	(0.08)
		P2	0.01	0.01	-0.07
			(0.04)	(0.00)	(0.1)
EGMA	Proficiency	P1	0	0.02	0.08
			(0.5)	(0.01)	(0.09)
		P2	0	0	-0.07
			(0.05)	(0)	(0.11)
	Level 1 addition	P1	2.05	1.48**	3.92*
			(2.61)	(0.56)	(2)
		P2	5.01	0.12	-1.06
			(3.48)	(0.47)	(1.96)
	Level 1 subtraction	P1	1.42	1.46**	2.49
			(2.32)	(0.49)	(1.74)
		P2	3.82	0.45	-1.86
			(3.28)	(0.62)	(1.87)
LEGRA	Proficiency	P1	0.08	0.03	0.04
			(0.27)	(0.03)	(0.17)
		P2	0.12	0	0.06
			(0.33)	(0.04)	(0.16)
		P3	0.23	-0.06	-0.12
			(0.42)	(0.06)	(0.19)
	Reading fluency	P1	3.37	0.97	4.5
			(6.04)	(0.85)	(5.57)
		P2	12.84	0.9	4.98
			(10.7)	(1.71)	(6.64)
		P3	31.85	-4.14	-9.33
			(19.44)	(3.18)	(15.13)

Notes: The statistical significance of differences across sub-samples is denoted with the following key: * p<0.10, ** p<0.05, *** p<0.01.
Small class size is defined as class size below the 50th percentile; large class size is defined as class size above the 50th percenile.

Table 9: Detailed Results (EGRA) - 2022-23 School Year (Phase 1 & 2 Schools)

	All		Nursery 3		Primary 1		Primary 2	
	Comparison schools at end of '21-22 school year mean	Treatment effect	Comparison schools at end of '21-22 school year mean	Treatment effect	Comparison schools at end of '21-22 school year mean	Treatment effect	Comparison schools at end of '21-22 school year mean	Treatment effect
Print orientation (%)	59.13	7.12	40.22	9.28	59.97	15.15	72.54	-3.36
Listening comprehension (%)	18.64	14.87	15.67	14.68	20.02	15.70	19.48	14.64
Initial sound identification (%)	36.09	12.23	18.57	11.15	36.84	18.71	48.56	7.19
Phonemic awareness (%)	23.43	11.01	9.53	11.54	23.33	16.77	34.03	6.29
Oral vocabulary (%)	33.83	10.24	24.96	10.58	35.48	11.95	38.84	9.65
Letter names (#)	3.52	7.19	1.2	3.06	3.13	8.33	5.67	10.18
Non-familiar words (#)	6.68	7.77	-	-	-	-	6.68	7.77
Familiar words (#)	5.08	5.11	-	-	3.39	4.01	6.84	6.23
Reading fluency (cwpm)	5.32	6.94	-	-	3.01	7.12	7.71	6.76
Reading comprehension (%)	5.11	10.14	-	-	4.02	7.87	6.24	12.45
Proficiency	52.32	-26.02	-	-	61.98	-28.19	42.35	-23.75

Averaged across Phase 1 & Phase 2 schools, weighted by total pupil enrolment.

Table 10: Detailed Results (EGMA) - 2022-23 School Year (Phase 1 & 2 Schools)

	All		Nursery 3		Primary 1		Primary 2	
	Comparison schools at end of '21-22 school year mean	Treatment effect	Comparison schools at end of '21-22 school year mean	Treatment effect	Comparison schools at end of '21-22 school year mean	Treatment effect	Comparison schools at end of '21-22 school year mean	Treatment effect
Counting circles (%)	80.67	14.14	69.1	18.22	90.38	9.10	-	-
Number identification (%)	50.53	16.84	29.76	13.63	47.41	25.27	69.95	12.91
Number discrimination (%)	63.32	8.53	42.07	2.67	64.28	16.79	79.34	5.88
Missing number identification (%)	39.52	8.06	31.25	5.89	46.82	10.03	39.15	7.20
Word problems (%)	31.3	4.31	11.98	7.20	38.31	8.16	39.95	-1.30
Addition - L1 (%)	31.09	11.56	15.1	5.92	28.91	15.59	45.92	12.72
Addition - L2 (%)	15.97	9.27	-	-	11.96	10.23	19.76	8.72
Subtraction - L1 (%)	27.18	10.39	11	4.89	24.47	16.72	42.66	9.21
Subtraction - L2 (%)	14.98	5.72	-	-	8.98	9.35	20.66	2.55
Multiplication (%)	34.2	6.07	-	-	-	-	34.20	6.07
Division (%)	31.24	1.89	-	-	-	-	31.24	1.89
Shape recognition (%)	81.96	5.48	80.24	14.32	80.72	-0.61	84.51	6.05
Proficiency (%)	10.92	9.84	18.45	10.55	5.47	14.00	10.12	3.82

Averaged across Phase 1 & Phase 2 schools, weighted by total pupil enrolment.

Table 11: Share of Pupils at "Grade-Level" in English at the End of Each School Year, By Treatment Assignment and School Phase

Grade	Group	Government benchmarks		Internal benchmarks	
		End of 2021-22	End of 2022-23	End of 2021-22	End of 2022-23
P1	Comparison	8.8	12.8	3.2	0.0
	Treatment - Phase 1	30.4	33.0	8.1	0.7
	Treatment - Phase 2	-	47.8	-	6.1
P2	Comparison	20.2	24.2	2.7	2.0
	Treatment - Phase 1	32.9	36.7	12.0	2.4
	Treatment - Phase 2	-	48.1	-	9.7

Note: The government benchmarks for "Meet" or above are 10 cwpm in P1, and 15 cwpm for P2. The internal benchmarks are 40 cwpm for P1 and P2.

Table 12: Gender Differences in Learning Outcomes After 47 Weeks, By Assessment and Subskill

		Baseline		Treatment effect	
Assessment	**Subskill**	**Score for boys**	**Difference girls-boys**	**Boys**	**Girls**
EGRA	Reading fluency	1.18	0.31	7.35	6.71
	Reading comprehension	0.51	0.51	9.49	10.78
EGMA	Level 1 addition	13.40	-0.47	9.89	12.73
	Level 1 subtraction	11.02	0.04	9.88	10.45
LEGRA	Reading comprehension	20.46	3.05	2.03	0.98

Averaged across Phase 1 & Phase 2 schools, weighted by total pupil enrolment.

Table 13: Estimated Reduction in the Fiscal Burden of Teacher Absenteeism from February 2022–June 2023

	% Teachers Present
First three weeks of the programme	66%
Last three weeks of the 2022-23 school year	89%
Gain in teacher attendance	23%
Number of teachers in the programme, Y1	3,042
Average annual salary (USD) as of 2022	2,069
Fiscal burden of absenteeism before the programme (RWF)	2,673,157,500
Reduced fiscal burden of absenteeism (USD)	**-1,444,950**
Reduced fiscal burden of absenteeism (RWF)	**-1,806,187,500**
Percent reduction of total fiscal burden of teacher absenteeism	**68%**

Notes: Exchange rate is 1250 RWF for 1 USD as of December 2023.

Salary was approximated using 2022 education expenditure data from UIS.

Table 14: Hours of High-Quality Instructional Time Per Week

	First 5 weeks of the programme (Term 2 of 2021-22 school year)	Last term of the programme (Term 3 of 2022-23 school year)
Average instructional hours scheduled	33.5	33.5
Lost to lessons not being started or successfully completed	-27.8 (17% lesson completion rate)	-7.7 (77% lesson completion rate)
Remaining instructional time	5.7	25.8
Lost to pupil absenteeism	-1.4 (76% pupil attendance)	-3.1 (88% pupil attendance)
Total high-quality instructional hours received by the average pupil per week	4.3	22.7

Appendix D: Additional Figures

Distribution of Correct Kinyarwanda Reading Comprehension Questions Answered Before the Start of the Programme, by Grade

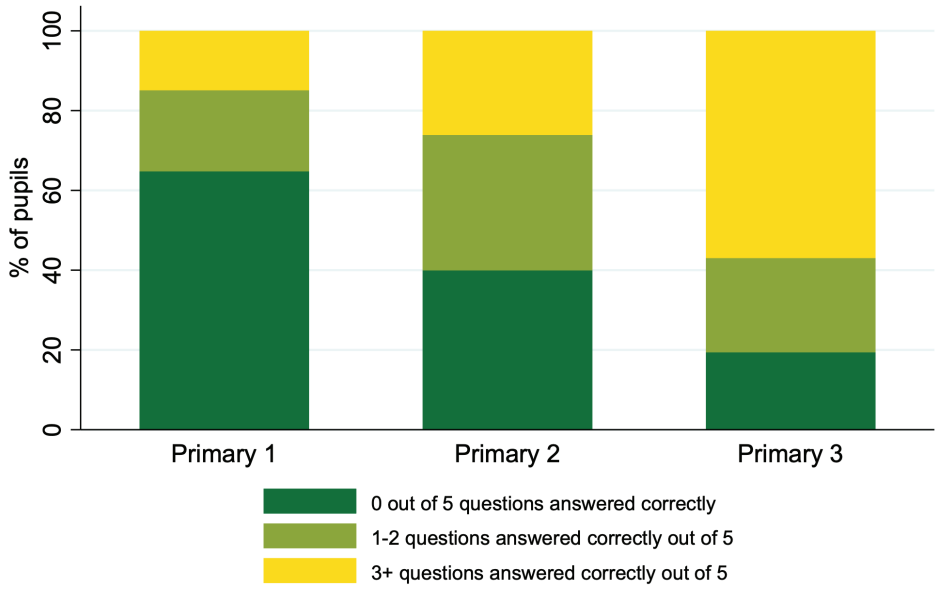
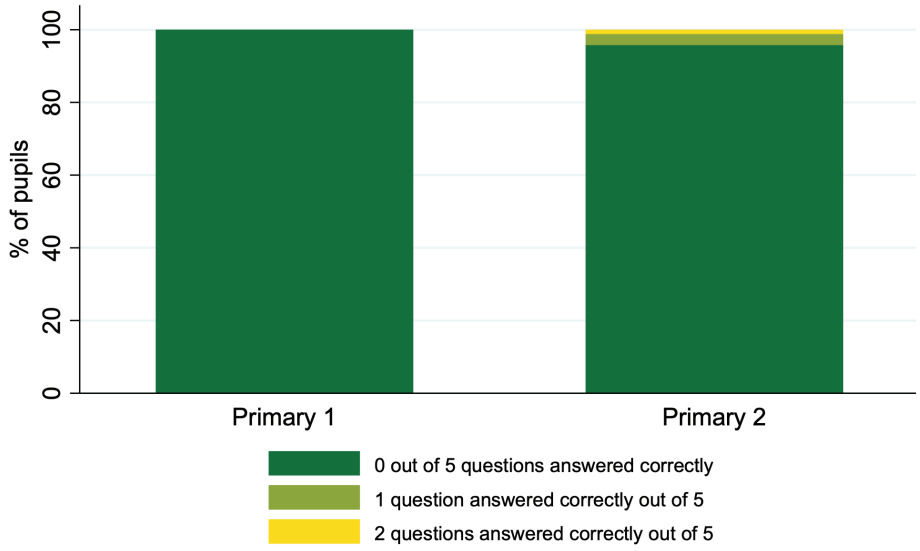


Figure 1

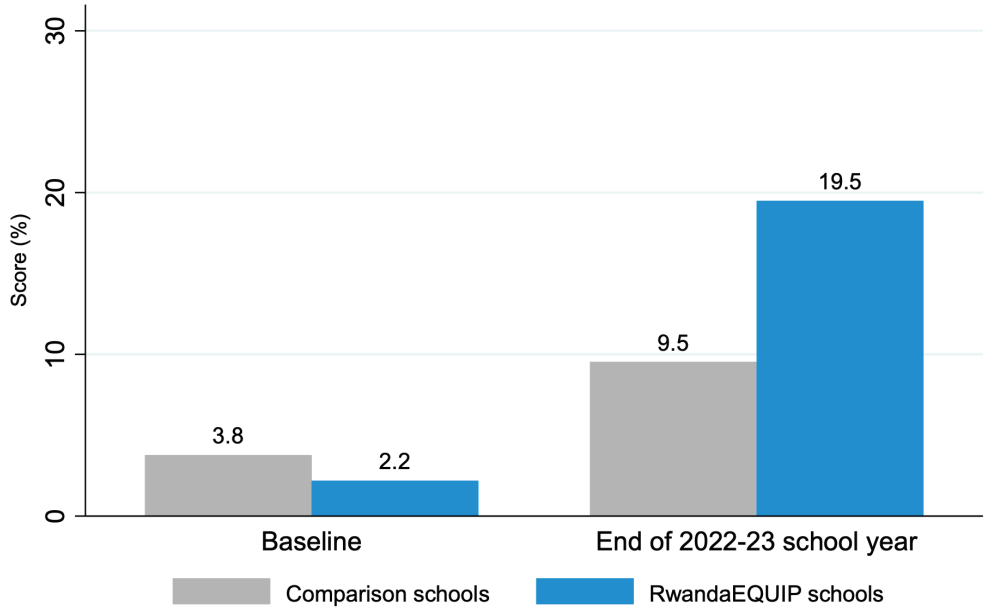
Distribution of Correct English Reading Comprehension Questions Answered Before the Start of the Programme, by Grade



Note: No pupils correctly answered 3 or more reading comprehension questions.

Figure 2

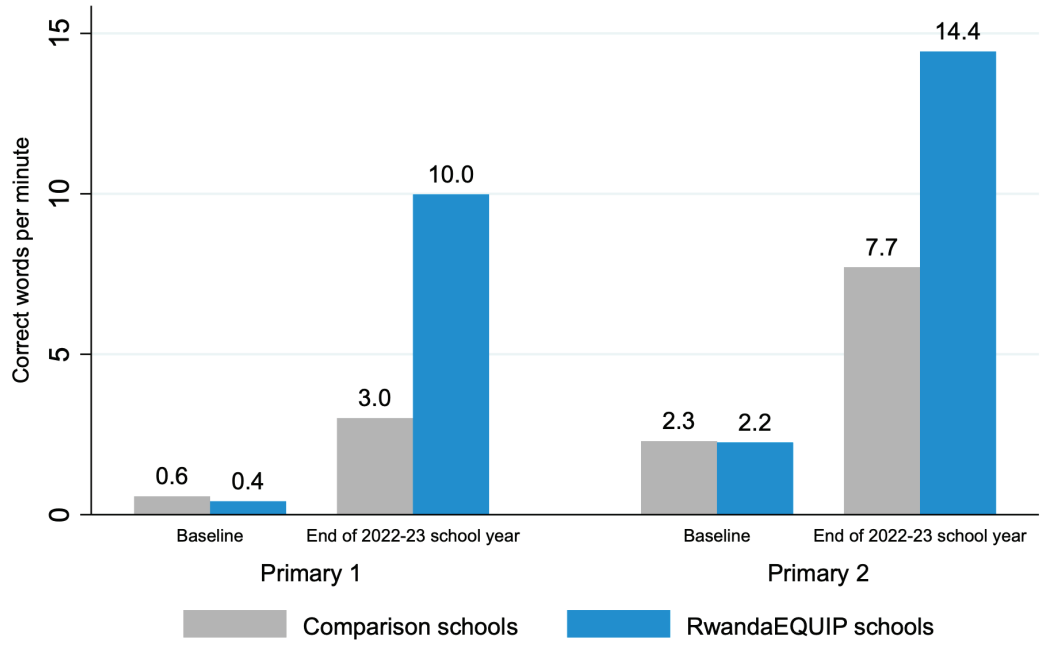
Phonemic Awareness in English in Nursery 3



Note: Each round is averaged across RwandaEQUIP phase 1 and 2 schools, weighted by pupil enrollment; RwandaEQUIP baseline data were collected from phase 1 in February of 2022, and phase 2 in October of 2023.

Figure 3

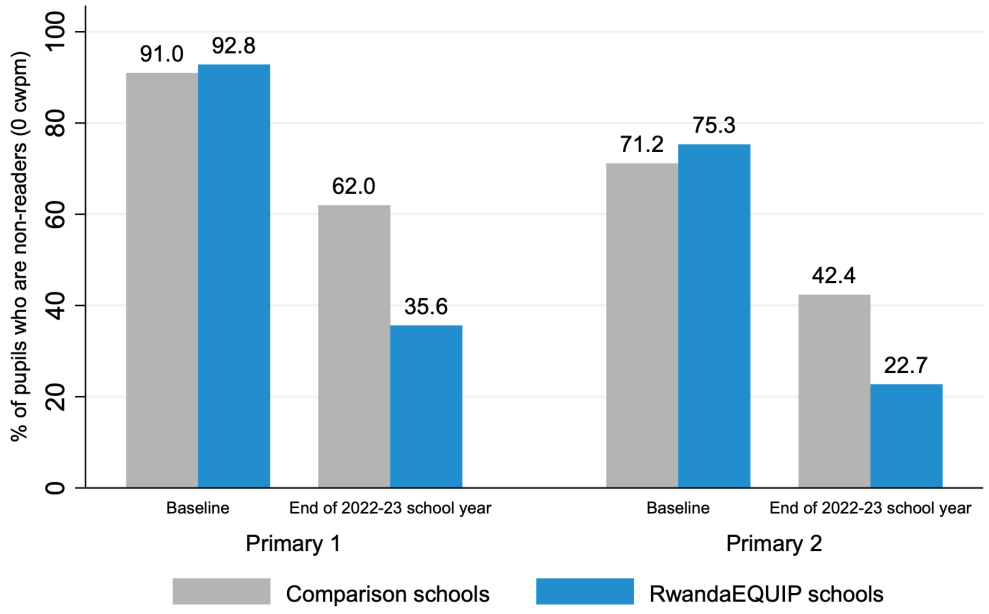
Reading Fluency in English



Note: Each round is averaged across RwandaEQUIP phase 1 and 2 schools, weighted by pupil enrollment; RwandaEQUIP baseline data were collected from phase 1 in February of 2022, and phase 2 in October of 2023.

Figure 4

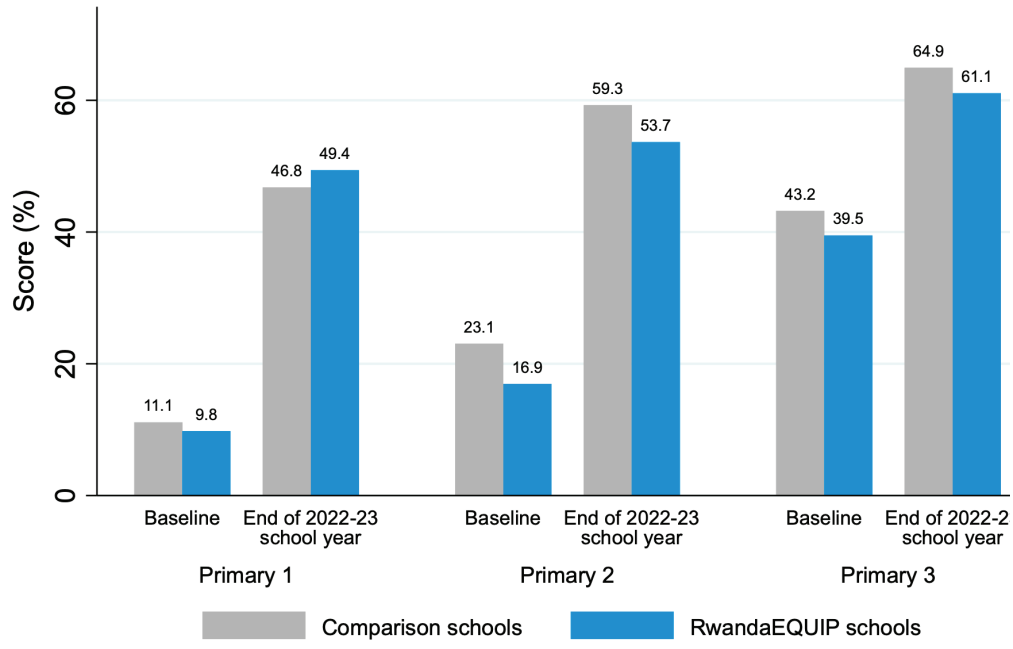
Non-readers in English



Note: Each round is averaged across RwandaEQUIP phase 1 and 2 schools, weighted by pupil enrollment; RwandaEQUIP baseline data were collected from phase 1 in February of 2022, and phase 2 in October of 2023.

Figure 5

Reading Comprehension in Kinyarwanda



Note: Each round is averaged across RwandaEQUIP phase 1 and 2 schools, weighted by pupil enrollment; RwandaEQUIP baseline data were collected from phase 1 in February of 2022, and phase 2 in October of 2023.

Figure 6

Difference in Distributions of Addition Between Phase 1 and Comparison Schools

End of 2022-23 school year

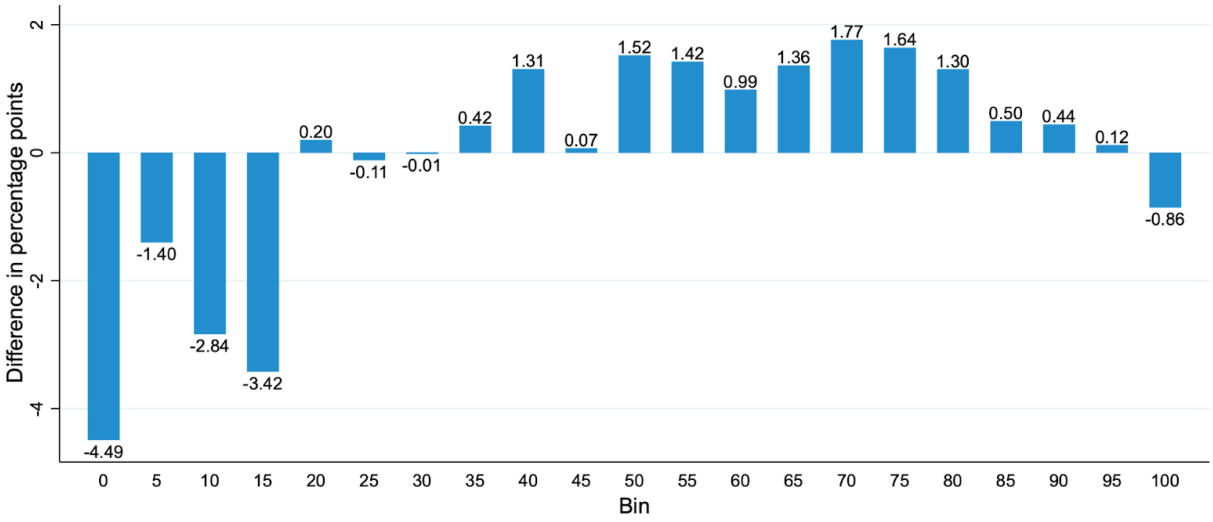


Figure 7

Comparison of Pupil Reading Fluency Levels in Phase 2 and Comparison Schools

End of 2022-23 school year

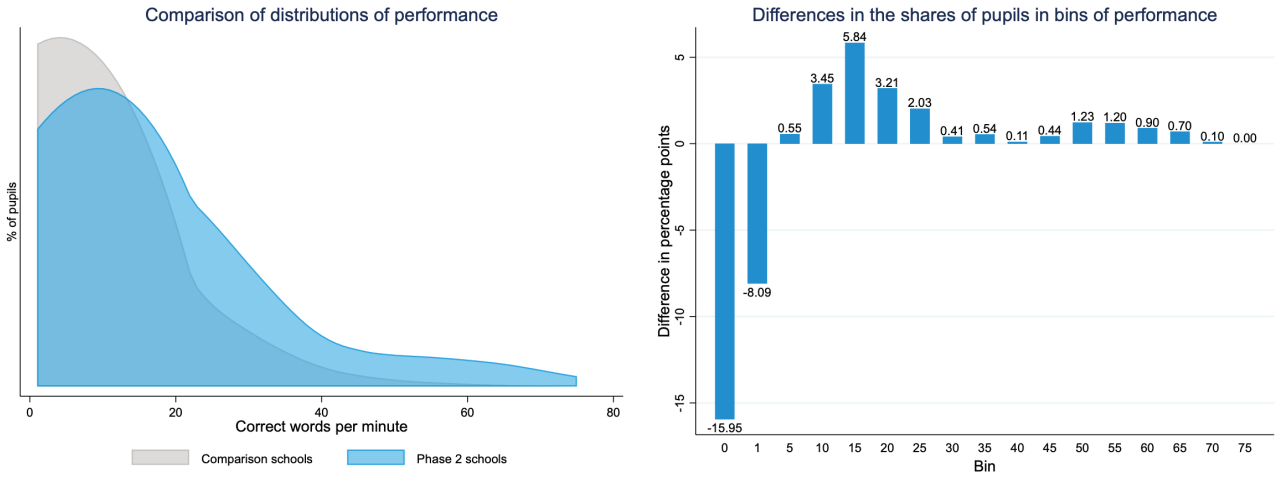


Figure 8

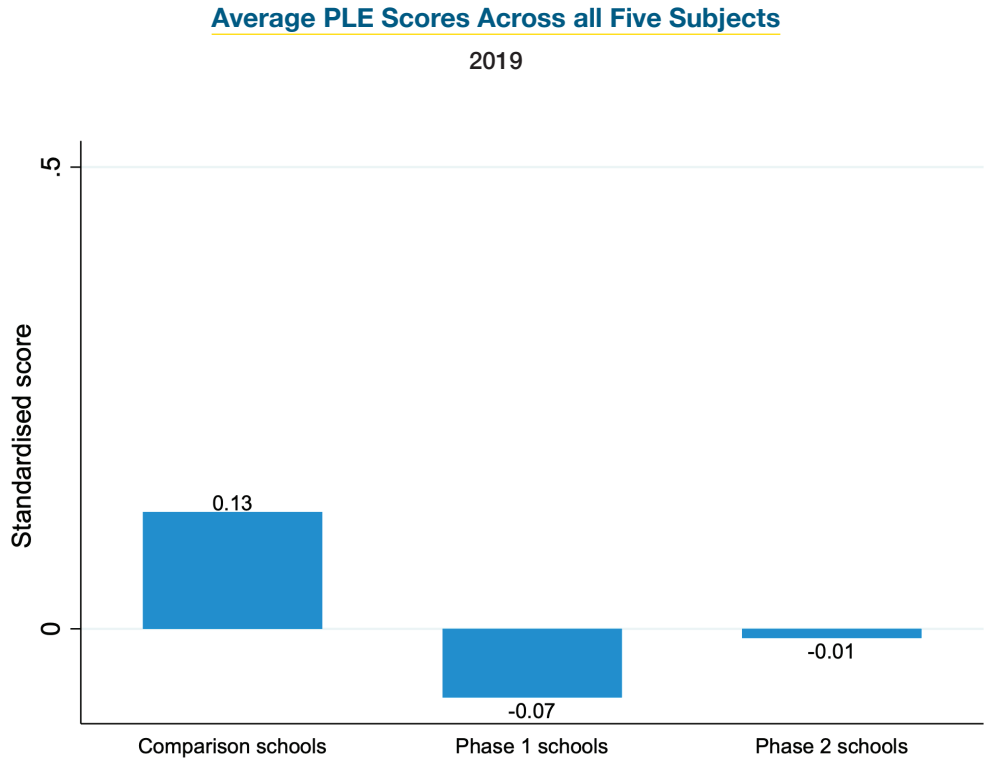


Figure 9

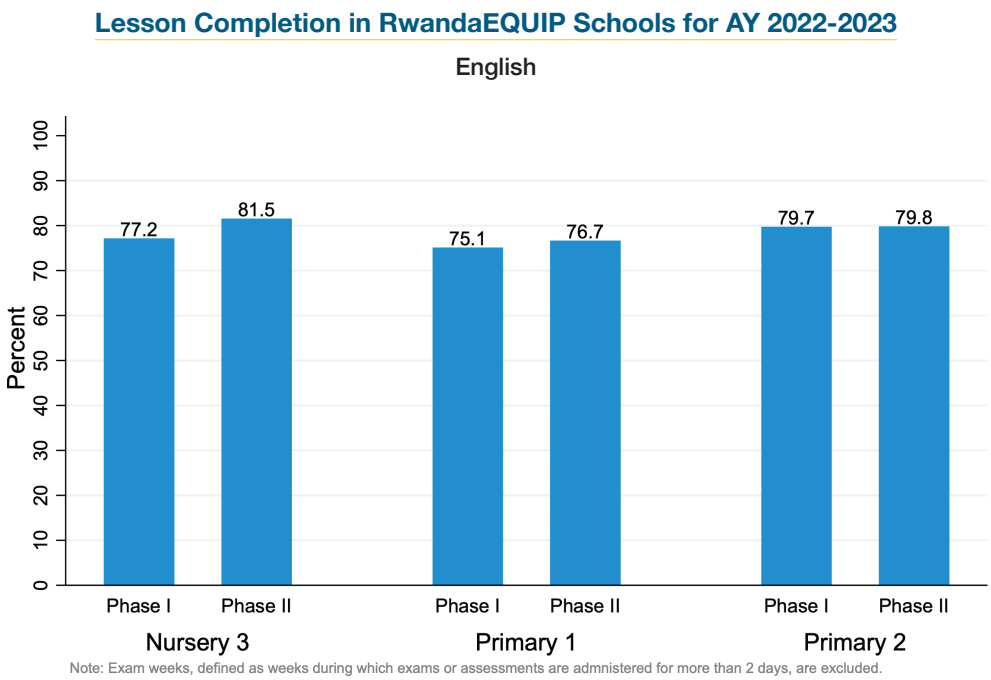


Figure 10

Lesson Completion in RwandaEQUIP Schools for AY 2022-2023

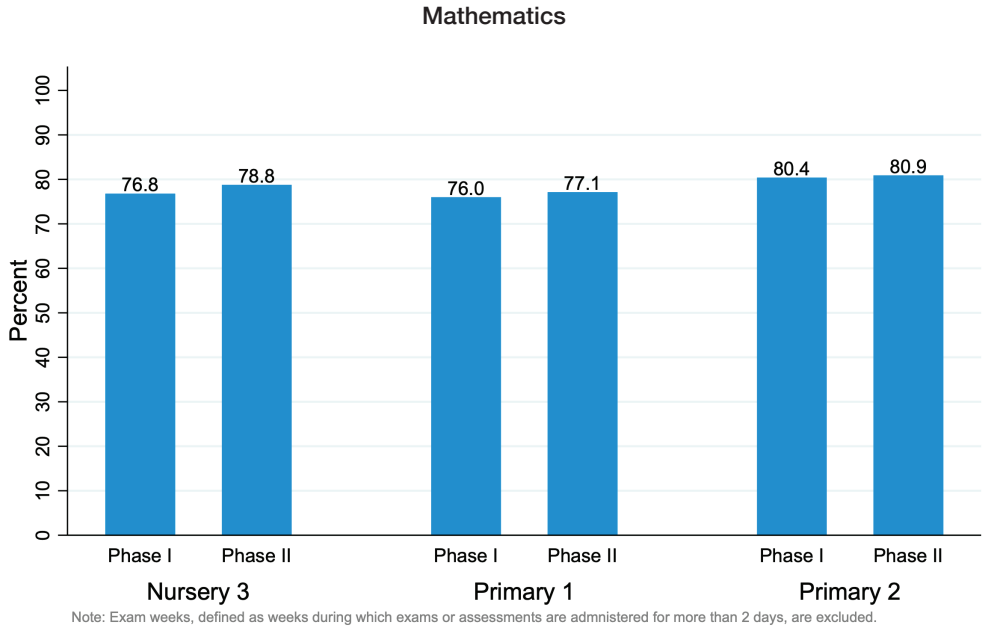


Figure 11

Relationship Between Teachers' English Fluency and Pupils' English Fluency Growth in 47 weeks

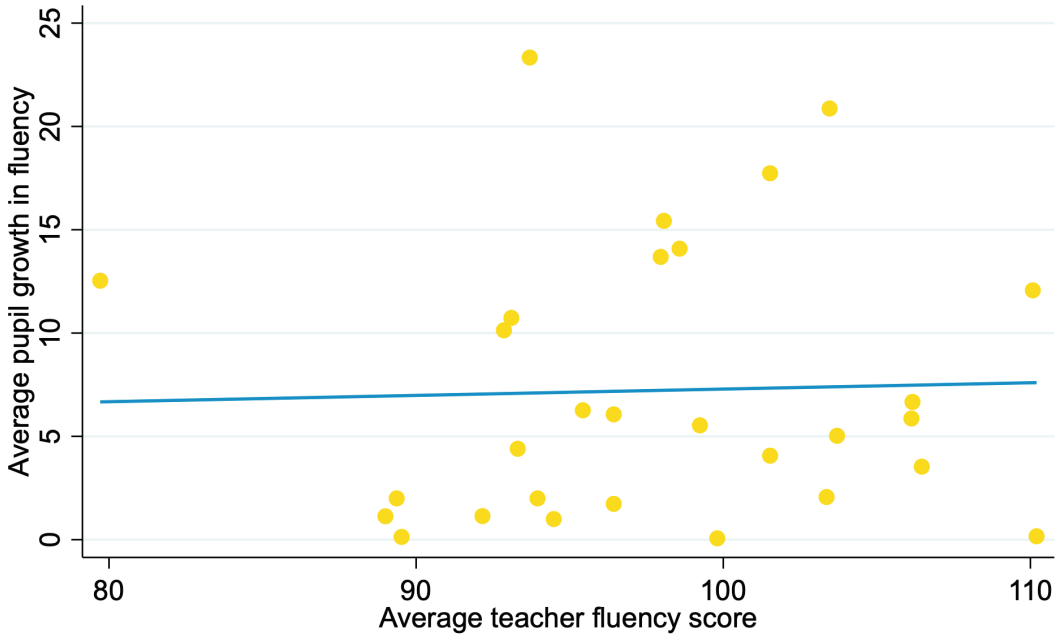


Figure 12

Relationship Between Teachers' English Fluency and Pupils' English Fluency Growth in 47 weeks

Primary 2

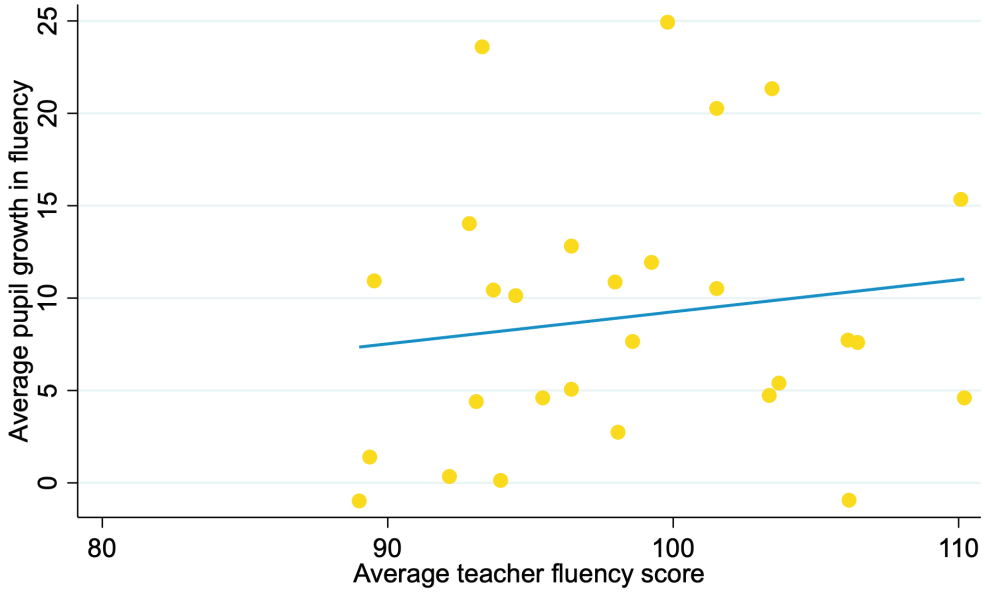


Figure 13

Appendix E: NESA 2022 Primary Subject Benchmarks

Table 1: Benchmarks and Cut-Score for Primary-Level English and Mathematics

Subject	Grade	Does not meet (in %)		Partially meets (in %)	Meets (in %)	Exceeds (in %)	Benchmarks (in %)
English	P1	0	1 - 27.1	27.2 - 50.5	50.6 - 79.3	79.4 - 100	50.6
English	P2	0	1 - 29.0	30.0 - 50.9	51.0 - 81.6	81.7 - 100	51.0
English	P3	0	0 - 49.9	50.0 - 65.9	66.0 - 91.9	92.0 - 100	66.0
English	P4	0	1 - 24.3	25.0 - 52.1	52.2 - 89.3	89.4 - 100	52.2
English	P5	0	1 - 24.3	26.1 - 47.1	47.2 - 88.8	88.9 - 100	47.2
English	P6	0	0 - 49.9	50.0 - 67.9	68.0 - 96.9	97.0 - 100	68.0
Mathematics	P1	0	1 - 21.0	22.0 - 58.0	58.0 - 79.0	80.0 - 100	58.0
Mathematics	P2	0	1 - 34.0	35.0 - 58.0	58.9 - 84.3	84.4 - 100	58.9
Mathematics	P3	0	1 - 39.9	40.0 - 50.3	50.4 - 91.9	92.0 - 100	50.4
Mathematics	P4	0	1 - 34.3	34.4 - 57.7	57.8 - 82.7	82.8 - 100	57.8
Mathematics	P5	0	1 - 31.6	31.7 - 55.5	55.6 - 85.5	85.6 - 100	55.6
Mathematics	P6	0	0 - 47.9	48.0 - 62.9	63.0 - 97.9	98.0 - 100	63.0

Source: NESA. (2022). Learners benchmarks cut-score for Primary education subject grade-level competencies.

Table 2: English Benchmarks and Cut-Score for Oral Reading Fluency and Comprehension

Skill	Does not meet	Partial meets	Meets	Exceeds	Benchmarks
			P1		
Reading Fluency	0 - 4 CWPM	5 - 9 CWPM	10 - 13 CWPM	14+ CWPM	10 CWPM
Comprehension	0 questions out of 5 (20%)	1.4 questions out of 5 (28%)	2.4 questions out of 5 (48%)	4.4-5 questions out of 5 (88%+)	2 questions out of 5 (48%)
			P2		
Reading Fluency	0 - 5 CWPM	6 - 14 CWPM	15 - 27 CWPM	28+ CWPM	15 CWPM
Comprehension	0 questions out of 5 (20%)	1.4 questions out of 5 (28%)	2.4 questions out of 5 (48%)	4.3-5 questions out of 5 (87%+)	2 questions out of 5 (48%)
			P3		
Reading Fluency	1 - 17 CWPM	18 - 34 CWPM	35 - 62 CWPM	63+ CWPM	35 CWPM
Comprehension	1 questions out of 5 (20%)	2 questions out of 5 (40%)	3 questions out of 5 (60%)	4+ questions out of 5 (80%+)	3 questions out of 5 (60%)
			P4		
Reading Fluency	0 - 23 CWPM	24 - 39 CWPM	40 - 79 CWPM	80+ CWPM	41 CWPM
Comprehension	0 questions out of 5 (20%)	0.7 questions out of 5 (13%)	2.2 questions out of 5 (44%)	4.3-5 questions out of 5 (86.7%+)	2 questions out of 5 (44%)
			P5		
Reading Fluency	0 - 42 CWPM	43 - 79 CWPM	80 - 90 CWPM	91+ CWPM	80 CWPM
Comprehension	0 questions out of 5 (20%)	1.3 questions out of 5 (27%)	2.8 questions out of 5 (56%)	4.3-5 questions out of 5 (87%+)	3 questions out of 5 (56%)
			P6		
Reading Fluency	0 - 42 CWPM	43 - 84 CWPM	85 - 94 CWPM	95+ CWPM	85 CWPM
Comprehension	0 questions out of 5 (24%)	1.2 questions out of 5 (24%)	2.4 questions out of 5 (48%)	4.7-5 questions out of 5 (93%+)	2 questions out of 5 (48%)

Source: NESA. (2022). Learners benchmarks cut-score for Primary education subject grade-level competencies.

Appendix F: Hasbrouck-Tindal English Oral Reading Fluency Norms

The Hasbrouck-Tindal Oral Reading Fluency Norms are widely used as a tool to benchmark appropriate pupil progress in English oral reading fluency, given their developmental stage at different points of their Primary school experience. These benchmarks are developed based on data from a few different assessments, including DIBELS, collected primarily in high-income, English-speaking countries. The chart below contains the Hasbrouck-Tindal grade-level benchmarks for pupils in the 25th, 50th, and 75th percentiles during the Spring term, the last term of the school year. Furthermore, the chart also includes the average expected growth per week from a pupil in the 50th percentile at this point of the school year.

2017 Oral Reading Fluency Norms				
Grade	**25th percentile**	**50th percentile**	**75th percentile**	**Median average weekly improvement**
Primary 1	34 cwpm	60 cwpm	91 cwpm	2.0 cwpm
Primary 2	72 cwpm	100 cwpm	124 cwpm	1.6 cwpm
Primary 3	91 cwpm	112 cwpm	139 cwpm	0.9 cwpm
Primary 4	105 cwpm	133 cwpm	160 cwpm	1.2 cwpm
Primary 5	119 cwpm	146 cwpm	169 cwpm	0.8 cwpm
Primary 6	122 cwpm	146 cwpm	173 cwpm	0.3 cwpm

Appendix G: Technical Details on the Selection of the 30v30 Schools

A more extensive technical description of the selection process is provided here for the 30 treatment schools and 30 comparison schools in light of the propensity-score matching technique used:

1. We began with the set of 299 schools included in the census, and the 27 variables outlined below. Missingness for these 27 variables across the 299 schools was low: 13 variables had no missing values, and for those with some missingness, the missingness rate was only 1.4%. Across all observations, the missingness rate was 0.7%.

2. Given the relatively low number of observations in the census, we preferred to minimise the extent to which missingness on a given variable disqualified an observation from being considered. Therefore, variables were separated into those that had no missingness, and those that had at least one observation for which its value was missing. Through ordinary-least squares, each of the variables was regressed that had at least one missing value on the full subset of variables without missing values, and these regression coefficients were used to predict, and hence impute, the missing cells for this variable. Indicator variables were also created that highlighted whether the value of each observation for a given variable was missing. This yielded a dataset of 299 observations and 27 core variables with no missingness, as well as an additional subset of variables with indicators for whether each observation was missing a value for that specific variable.

3. Using the complete data set, a logistic regression was run using an indicator of whether each school was part of the 100 RwandaEQUIP schools or not as the dependent variable. The independent variables consisted of the set of 27 covariates along with their respective indicators for missingness.

4. Using the results of the logistic regression, a propensity score for all 299 schools was created, which indicated the likelihood of being selected into the set of 100 RwandaEQUIP schools.

5. Stratifying by province, the propensity score was leveraged to find a pair for each treatment school within the pool of comparison schools. This was done using a “nearest neighbour” approach (nn=1) without replacement, and using the psmatch2 command in Stata with a calliper of 0.50. This approach yielded 40 potential pairs of treatment and comparison schools that were in the common support area of the propensity scores within their provinces. 30 of these potential pairs were randomly selected to be included in the sample.

6. Finally, balance tests were run to ensure that these 60 schools were balanced on covariates — that is, representative on observables, of the 100 RwandaEQUIP schools, and that the 30 treatment and 30 comparison schools within this sample were also balanced. The balance tests were conducted through regression-adjusted frameworks, and the balance test between treatment and comparison schools also include fixed-effects for each pair, akin to strata fixed-effects.

School-level characteristics included in analysis

- Population count in 5-km radius around school
- Population 5-14 count in 5-km radius around school
- Population density in 5-km radius around school
- School is in Eastern province
- School is in Kigali
- School is in Northern province
- School is in Southern province
- School is in Western province
- ECD is currently available
- Schools have internet connectivity
- School was a duplicate in the census
- Total pupils according to SDMS
- Total pupils in ECD, according to census
- Total pupils in Primary, according to census
- Total number of teachers, according to census
- School-level pupil-teacher ratio

Schools selected for RME Plan in Year 1

Comparison schools		Treatment schools	
Name	**District**	**Name**	**District**
Curugusi	Gakenke	Bumba	Gakenke
E.P. Gafunzo	Ngoma	E.P. Cyuga	Gasabo
E.P. Kageshi	Rubavu	E.P. Kiryi	Musanze
E.P. Karugira	Kicukiro	E.P. Mbatabata	Gakenke
E.P. Gasagara	Gasabo	E.P. Muhira	Rubavu
E.P. Kigarama	Ngoma	E.P. Rubago	Ngoma
E.P. Rugeshi	Musanze	E.P. Yaramba	Nyaruguru
G.S. Nkanka	Rusizi	G.S. Muganza Ii	Kamonyi
G.S. Kirwa	Gicumbi	G.S. Muhondo	Gicumbi
G.S. Bibare Ngarama	Gatsibo	G.S. Gatizo	Kamonyi
G.S. Kabirizi B	Ngoma	G.S. Jarama	Ngoma
G.S. Masaka 1	Kicukiro	G.S. Kimisange	Kicukiro
G.S. Muhato	Rubavu	G.S. Kigina	Kirehe
G.S. Sheli	Kamonyi	G.S. Muyange	Kicukiro
G.S. St J Bosco Kamonyi	Kamonyi	G.S. Ryabizige	Rubavu
G.S. Bisagara	Kirehe	G.S. Saint Vincent Pallotti Gikondo	Kicukiro
G.S. Kagarama	Nyaruguru	G.S. Gahengeri	Karongi
G.S. Kivumu	Musanze	G.S. Gakiri	Gatsibo
G.S. Mugogo	Kirehe	G.S. Kimironko I	Gasabo
G.S. Musave	Gakenke	G.S. Munini	Nyaruguru
G.S. Mutongo	Rusizi	G.S. Murambi I	Gatsibo
G.S. Nyamiyaga	Nyamagabe	G.S. Nyinawimana	Gicumbi
G.S. Rubingo	Gasabo	G.S. Nyabikiri	Gatsibo
G.S.. Gasaka	Nyamagabe	G.S. Nyarubuye	Gatsibo
G.S.ndg Janja	Gakenke	G.S. St Dominic Gihara	Kamonyi
Kabusunzu Ps	Gatsibo	Kibali	Gicumbi
Kanogo	Ngororero	Kuruganda	Karongi
Kinunga Ps	Kicukiro	Mujyojyo	Karongi
Marimba Primary School	Gatsibo	Nyange P	Ngororero
Muramba A	Ngororero	Zaza B P/S	Ngoma

Appendix H: An Overview of the Data Quality Assurance Protocol

The Context Surrounding the Quality Assurance Protocol

Foundational **literacy** and **numeracy** (FLN) skills amongst children in any given education system are integral to their success, both within their academic careers and in their everyday lives. Proficiency in these two fundamental sources of knowledge can be used as a measure of overall education quality, but it is something that is often lacking in pupils attending schools in low- and middle-income countries (LMIC). Transforming this distressing reality is a direct focus of NewGlobe's government-partnered education reform strategies. However, bringing pupil competencies in these core skills up to ideal levels necessitates that those competencies be properly assessed and measured before, during, and after our programmatic interventions.

To achieve this, we use internationally validated assessments that contextualise where pupil learning levels are within the broader scope of where they need to be. Pupils are scored based on the number of correct responses they provide, and the number of incorrect responses is also recorded. For literacy, we use the **Early Grade Reading Assessment (EGRA)**, which is widely regarded by researchers as an effective literacy measurement procedure. This assessment uses several sub-tasks to measure literacy, including a passage to measure **oral reading fluency** (ORF), the subskill most strongly correlated with others on the path towards reading proficiency, and **reading comprehension**, the ultimate goal of literacy skills. In terms of reading fluency, pupils are scored based on the number of **correct words per minute** (cwpm), and incorrectly read words are also recorded. In order to assess pupil numeracy skills, we use the **Early Grade Mathematics Assessment (EGMA),** which has been adapted for use in more than 15 countries and consists of six sub-tasks: number identification, number discrimination, recognition of number patterns, addition, subtraction, and word problems. With these tools, we can benchmark pupils' learning levels based on their assessment scores, and thus precisely target our efforts to help them improve.

Furthermore, given that these assessments are what underpins some of the major policy decisions needed to benefit pupils to the greatest extent possible, it is vital that the data gathered from them is current and reliable. Therefore, to ensure efficient turnaround and accuracy of assessment scores, NewGlobe dispatches trained enumerators to administer the assessments in the schools our organisation serves. Enumerators are responsible for recording and reporting assessment scores with the utmost precision. In turn, NewGlobe is responsible for effectively monitoring these enumerators' output, to ensure that there are no observances permitted that may compromise the reliability of the data. To execute this undertaking, NewGlobe's Research, Measurement and Evaluation (RME) team has developed a **quality assurance protocol**.

The Goal of the Protocol

The quality assurance protocol is embedded within our larger data cleaning process — which is employed to correct erroneous, incomplete, or duplicate information from our data sets — and certifies that the data collection completed by enumerators is of the expected calibre. This is the primary function of the protocol, and what allows it to reach its primary goal of supporting validated data that reflects actual pupil performance in the assessed skills.

In the interest of transparency and greater visibility into data-gathering performance patterns, the RME team also produces **quality assurance reports,** which detail our work in identifying problematic enumerator observations, thus allowing for targeted interventions to improve data quality. This documentation also serves as an internal guide to the quality assurance protocol for anyone in our organisation who is interested in understanding how we ensure data quality control.

Defining Quality Assurance Indicators

To facilitate analysis of the quality of our data, the RME team has implemented an automated approach, built with standardised code created in Stata — a statistical software platform — which allows us to identify certain indicators within the data that point to inaccuracies. These indicators reveal that some reported assessment scores may reflect an issue with enumeration, rather than a true measure of pupil ability. To further streamline this process, we've identified **seven indicators** that may be flagged for the possibility of potential issues that need to be investigated:

- **Indicator 1:** The share of observations showing that pupils are non-readers
- **Indicator 2:** The share of observations containing ORF scores of extreme values for a given grade
- **Indicator 3:** The share of observations containing ORF scores that surpass the maximum achievable score
- **Indicator 4:** The share of observations containing discrepant ORF scores
- **Indicator 5:** The share of observations containing identical ORF scores
- **Indicator 6:** The share of observations containing ORF scores that are multiples of 5
- **Indicator 7:** The correlation of scores among ORF, reading comprehension, and numeracy skills

While it is worth noting that not all of these indicators are, by themselves, a clear indication of inaccurate data, if the data cleaning process leads to the discovery of several of these indicators, this may indicate a pattern of malpractice among certain enumerators. Therefore, a thorough investigation into the specific cases flagged by these indicators is necessary to determine if there is an issue that compromises data quality.

Putting Guidelines in Place for Each Indicator

In order for these indicators to support our goal of consistent data quality assurance, the RME team must have frameworks in place for analysing them. Therefore, we have defined a **reasonable range** that we would expect assessment scores to fall within. Scores that are within two standard deviations (SDs) from the mean are considered reasonable, while scores that are outside of that are more closely examined as outliers requiring further verification. As such, some of the indicators described below revolve around identifying scores that exist above or below a reasonable range.

In addition to this, we have established a **frequency threshold** for how often indicators signifying potential errors in the data collection process should occur. That is, if more than 10% of a given enumerator's observations contain these indicators, the RME team will investigate the reliability of their findings accordingly.

Indicator 1: The share of observations showing that pupils are non-readers

The key question to answer for this indicator is whether the share of non-readers (those scoring zero correct words per minute) identified by enumerators is within the established reasonable range for a given territory. Observations outside of this range are considered to be an overestimation or underestimation of non-readers. Additionally, we investigate any discrepancies in the proportion of non-readers identified between the two passages used as assessments. We expect that enumerators who identify many pupils as non-readers using the grade-level ORF passage will also identify many non-readers using the standard-grade ORF passage, and vice versa.

Other parameters also determine whether this indicator suggests unreliable data. For instance, if most enumerators report a high proportion of non-readers in a given territory, it would not necessarily be viewed as a data quality issue. However, if only a few enumerators report a high proportion of non-readers, we will closely scrutinise the results from those enumerators to identify potential data quality issues. It is important to consider that some schools may genuinely have a higher share of non-readers, but we conduct a thorough evaluation of the data to confirm whether an actual trend exists in the territory, or whether it is an indication of errors in the data set.

Indicator 2: The share of observations containing ORF scores of extreme values for a given grade

Just as we expect there to be a reasonable range of non-readers, there should also be a realistic distribution of high-performers. For this reason, we also monitor enumerator observations for scores that would be considered outliers when viewed in conjunction with the other scores reported for pupils in a given grade. These scores would fall well outside of the reasonable range — clearly above or below what is expected of pupils — based on the typical scores seen in the rest of the sample. They would therefore be flagged as indicative of a potential data quality issue. Moreover, if the proportion of an enumerator's observations that are outside this range surpass the predetermined frequency threshold, then we would investigate the accuracy of the data based on how regularly these extreme values are occurring.

Indicator 3: The share of observations containing ORF scores that surpass the maximum achievable score

Since the assessment passages used to measure oral reading fluency contain a fixed number of words, it is impossible for a pupil to read a greater number of correct words than the total count in the passage. Even if they did not make any errors, the maximum achievable score would be equal to the total number of words in the passage. Consequently, enumerator observations showing ORF scores that exceed this number are considered an indicator of a potential data quality issue. However, it is important to clarify that the word limit can be adjusted during different data collection rounds to reflect the current passage, and this may be the source of the discrepancy.

Hence, we apply the same reasoning for this indicator as for the first indicator. If only a few enumerators report a disproportionately high share of unfeasible ORF scores when evaluating pupils in a given territory, while the majority of enumerators do not indicate such a trend, then there could be potential issues with the accuracy of their data collection worthy of closer examination. Similarly, the RME team would also scrutinise the output of an enumerator who records many excessively high scores for one of the assessment passages, but not for the other.

Indicator 4: The share of observations containing discrepant ORF scores

In addition to scores that surpass the total number of words read in a passage, we examine whether enumerator observations contain discrepant scores. A discrepant score is defined as a total number of words read that does not match the sum of correctly read words and incorrectly read words. It is unusual for an enumerator to produce a significant proportion of discrepant scores. However, we closely monitor their observations to ensure that enumerators do not include these errors in either or both of the two passages used for assessment.

Indicator 5: The share of observations containing identical ORF scores

Because it is typical for assessment scores to show variation, it is unlikely that enumerators would report a large share of observations containing the exact same ORF score. Therefore, an enumerator reporting a proportion of identical scores that is above the established threshold would prompt further examination to ensure the accuracy of the data. Likewise, we expect individual pupils to score differently on the different passages used for assessment. It is hence an indication of a potential data quality issue if enumerators report the exact same score for one pupil across both passages.

Indicator 6: The share of observations containing ORF scores that are multiples of 5

This indicator is focused on examining whether enumerators are reporting an excessive number of ORF scores that are multiples of five. Based on the typical range of reading fluency scores, we would expect only around 20% of scores to be multiples of five. Therefore, significant clusters or groupings of scores that are multiples of five, such as 100 cwpm, for example, would raise concerns about potential round number bias, rather than reflecting genuine variations in performance. In cases of high-quality data collection, we anticipate observing scores that are uniformly distributed across a range of values, including those that are multiples of five.

Furthermore, it is more probable for enumerators to report a score that is a multiple of five for one assessment passage than for both passages. Therefore, reporting a score that is a multiple of 5 for one passage is less concerning, but if an enumerator reports scores that are multiples of five for both assessment passages, it would be considered a flag and require further scrutiny.

Indicator 7: The correlation of scores among ORF, reading comprehension, and numeracy skills

Reading fluency, reading comprehension, and numeracy assessment scores tend to correlate with one another. Given this relationship, we assess whether the correlations among these skills reported by specific enumerators differ significantly from those observed across the rest of the sample.

Correlations that are disproportionately higher or lower than others could indicate a serious data quality concern. Correlative deviations may signify inattentive and imprecise observations completed by enumerators — especially in the case of lower correlations — and they can also point to inaccurate assumptions being made about pupils' competencies in one or more of these skills, based on their performance in other skills, which would mean an inaccurate reading of their learning levels.

Understanding How the RME Team Interacts With Quality Assurance Indicators to Maximise Data Quality

Part 1: Creating flags for each indicator across observations

If the observations completed by enumerators contain these indicators, and the number of indicators exceeds the frequency threshold or contain scores that are outside the reasonable range, flags will be raised to signify the need for review of the data. To standardise this process, the RME team has created code to flag the issues defined by each indicator, for each of the observations in a data set. The specifics of this code ensure that these flags identify the individual enumerator who completed the observations, thereby establishing accountability norms and governance over performance patterns.

Part 2: Aggregating data for each indicator, by enumerator

After the indicator flags for each observation have populated, the next step involves aggregating the data embedded in each indicator, per enumerator. This allows us to quantify the number of flags per indicator that are occurring as a result of a given enumerator's data collection process, which provides further insight into the consistency with which they report accurate data.

Part 3: Investigating enumerator alert rates based on indicators

These tools, used for identifying potential errors within enumerators' observations, provide us with an **alert rate**, which serves as part of the basis for determining which enumerators' data collection processes require further investigation. An alert rate is a metric that measures the severity of potential errors in an enumerator's work. It is calculated by dividing the number of flagged indicators for an enumerator by the total number of indicators present. A higher alert rate indicates a higher likelihood of errors, and potentially reduced reliability in an enumerator's data collection. We pinpoint enumerators with comparatively high alert rates and rigorously examine the data they collected to determine whether the improbabilities found in their data are genuine, or if they are indicative of unreliable data collection.

Part 4: Reporting enumeration performance to the data collection team

By implementing these measures, our organisation can conduct a thorough evaluation of enumeration performance aligning with our mission to uphold data integrity. Once we have followed these steps, which ensure a sound evaluation of each enumerator's data collection process, we share our results with the data collection team. At this stage, the team carries out independent investigations and takes proactive measures to address any identified issues. Via this iterative process, we foster a collective effort to promote transparency and accountability, and reinforce our commitment to deliver accurate and trustworthy data.

Appendix I: Qualitative Data Collection Protocol

Purpose and Framing

The goal of this exercise is to understand what went well during the first months of the programme, and what did not.

We understand that there were several operational challenges throughout these initial months. However, as we collect this data, we do not want to prime respondents against any particular issue. Instead, we want to hear their candid opinions and the specific issues that, in their view, were the most significant hindrances to achieving a smoother programme implementation.

The questions below are not intended to be full script. While interviewers should try to cover as much ground as possible, a key to collecting in-depth data via interviews is making the interviews "flow" by avoiding a feeling of "call-and-response" (i.e., jumping from one question to the next without any follow ups). In other words, these questions are not meant for you to religiously ask one, and move on to the next. Instead, they serve as a guide about the conversations that you should be bringing up, but also feel free to ask follow up questions and pursue tangents, if these appear to be fruitful sources of information.

Throughout your conversation, please make sure to take detailed notes. If the interview allows AND you feel that this might not bias their responses, feel free to record the conversation. Otherwise, detailed notes, quotes, and any other evidence/opinions that they might produce should be documented.

How to Start the Interview?

The following paragraph serves as a potential guide on how you may want to frame the conversation from the start. Please **do NOT** read this paragraph verbatim — simply understand the main points, and then relay these to each interviewee at the beginning of each conversation:

"Thank you for your help today. We are working on understanding how the first months of RwandaEQUIP went — both the positive things, and the things that still need improvement. None of this conversation is a test, and none of your responses will be used against you in any way! In fact, we are looking for your very honest opinion on how RwandaEQUIP could be improved further — what areas you struggled with, and what areas were not working at all. Any questions before we get started? Is it okay if I note your name, grades taught last semester, and the school where you work?"

Questions for teachers:

1. First, what are your general impressions about RwandaEQUIP?
2. Do you think that there are parts of the programme that are a clear improvement relative to before?
3. Were you trained in the methodology for RwandaEQUIP? If so, how helpful do you think it is to teach RwandaEQUIP-level material?
4. How closely have you been following the methodology that you were trained on? Do you (1) follow the lesson guides closely, do you (2) use them as just some support but you can improvise/go "off script" sometimes, or do you (3) not use it at all?
5. If you have noticed any improvement in how much pupils are learning in class, have these gains been from the pupils who were the lowest performing or the highest performing?
6. What do you do to help low performing pupils learn how to read?
7. What issues, both about the programme or from outside of it (e.g., like in your school) were the most problematic in terms of incorporating the RwandaEQUIP methodology into your teaching? Even if you wanted to use this programme as you were trained on, what makes it hard to do so?
8. Did your school leader or your supervisor encourage you to engage with the programme? What do you think their attitudes towards the programme were?
9. If you could ask for 2 or 3 things to ensure that you implement this programme properly, what would they be? What could be improved by next year to make you either use the techniques more, or to ensure that you are more effective in using these techniques?

Questions for head teachers:

1. First, what are your general impressions about RwandaEQUIP?
2. What do you think your teachers' general impressions about RwandaEQUIP are?
3. During its first year of operations, RwandaEQUIP was rolled out in all Primary levels. Did you notice how the teachers taught the programme between the lower-Primary pupils and upper-Primary pupils? Can you speak a little more about how this dynamic played out on a day-to-day basis?
4. In your observations, do you think the programme is better equipped for younger or older pupils?
5. Since implementing the programme, what are some major changes that you have noticed among the teachers, especially in regard to classroom management and teaching behaviours? Were there particular subjects where these changes were more apparent?
6. Think back to your conversations with your teachers throughout the last semester: what do you think their #1 complaint about the programme was?
7. If you could ask for 2 or 3 things to ensure that you implement this programme properly, what would they be? What could be improved by next year to make you either use the techniques more, or that you are more effective in using these techniques?

Questions for supervisors:

1. What are your general impressions of how RwandaEQUIP has been going?
2. Do you think that there are parts of the programme that are a clear improvement relative to before?
3. How closely do you think that teachers have been following the methodology that they were trained on? Do they (1) follow the lesson guides closely, do they (2) use them as just some support but they can improvise/go "off script" sometimes, or do they (3) not use it at all?
4. In your observations, what areas of the programme were the most problematic in terms of incorporating the RwandaEQUIP methodology into the classroom?
5. During its first year of operations, RwandaEQUIP was rolled out in all Primary levels. Did you notice how the teachers taught the programme between the lower-Primary pupils and upper-Primary pupils? Can you speak a little more about how this dynamic played out on a day-to-day basis?
6. In your observations, do you think the programme is better equipped for younger or older pupils?
7. Since implementing the programme, what are some major changes that you have noticed among the teachers, especially in regard to classroom management and teaching behaviours? Were there particular subjects where these changes were more apparent?
8. Since implementing the programme, do you think teachers have been teaching differently for the lowest performing pupils? What about for the highest performing pupils?
9. Think back to your conversations with your teachers throughout the last semester: what do you think their #1 complaint about the programme was?
10. When you provide teachers with feedback, how receptive have they been to this feedback?
11. If you could ask for 2 or 3 things to ensure that you implement this programme properly, what would they be? What could be improved by next year to make you either use the techniques more, or that you are more effective in using these techniques?

Sample data collection

We suggest that the collection of the data happens in an orderly and systematic manner. To do so, the RME team can support in the set up of a spreadsheet with the following structure (where there is one tab for teachers, one for head teachers, one for supervisors, etc.):

For teachers

Question	Respondent 1 Name: (if available) School: (if available) Grades taught last year: (if available)	Respondent 2 Name: (if available) School: (if available) Grades taught last year: (if available)	Respondent 3 Name: (if available) School: (if available) Grades taught last year: (if available)
Question 1	Response	Response	Response
Question 2	Response	[Not discussed]	Response
Question 3	Response	Response	[Not discussed]
Question 4	[Not discussed]	Response	Response
Question 5	Response	[Not discussed]	Response
Question 6	Response	[Not discussed]	Response
Question 7	[Not discussed]	Response	Response
Other comments	[Add here additional comments from the respondent]	[Add here additional comments from the respondent]	[Add here additional comments from the respondent]
Interviewer observations	[Add here any observations from the interviewer — what was the tone of the conversation? Hostile? Did they seem to really dislike the programme? Were they frustrated with certain aspects of the educational system, either within or outside of the programme? Did they seem sincere/insincere in their dislike/praise of the programme?]	[Add here any observations from the interviewer — what was the tone of the conversation? Hostile? Did they seem to really dislike the programme? Were they frustrated with certain aspects of the educational system, either within or outside of the programme? Did they seem sincere/insincere in their dislike/praise of the programme?]	[Add here any observations from the interviewer — what was the tone of the conversation? Hostile? Did they seem to really dislike the programme? Were they frustrated with certain aspects of the educational system, either within or outside of the programme? Did they seem sincere/insincere in their dislike/praise of the programme?]

Ideally, after each interview, we suggest that the interviewer either takes a few minutes to add all their notes to a new column, or at the very least, that they process their notes either on paper or in the spreadsheet, in such a way that they can come back to the spreadsheet later on, and have a clear memory of everything that was discussed so they can finish filling out the spreadsheet.

As shown in the example above, we do not need an answer for every question from every participant. Although we want to cover a lot of ground with each response, we also do not want to sacrifice candour and in-depth discussions for a more superficial coverage of all questions.

Finally, the interviewer should also take a few minutes to meditate about the subjective feel of the interview and of the respondent’s attitudes towards the programme. Any “vibe” that was not able to be transmitted through the other (more concrete) questions, should be incorporated into this section. Then, interviewers will include this information in the last row of the spreadsheet, for as many interviewees as possible.

Appendix J: The Learning Crisis in Low- and Middle-Income Countries: An Overview of Causes, Contributors, and Consequences

1. Enrolment and Literacy Rates in Low- And Middle-Income Countries Have Increased at Record Speed in Recent Decades

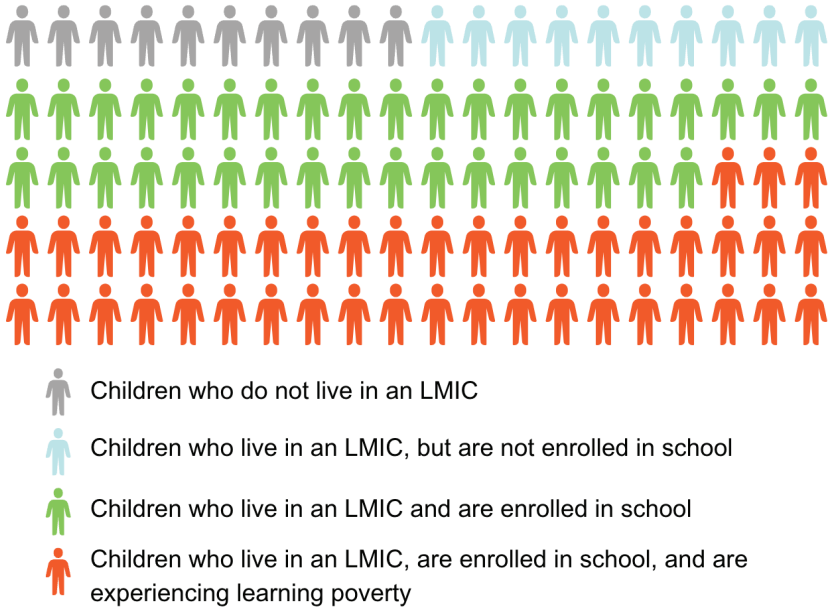
a. The growing global focus on broadening access to schools has led to significantly improved enrolment rates

Over the last 75 years, there has been a massive global shift towards the expansion of schooling infrastructure and enrolment outreach in an effort to reach a goal of universal education. As such, there are more children presently in school than at any other time in history (World Bank, 2018). Of them, 80% go through an education system in a low- to middle-income country, and in low- and middle-income countries (LMIC), in particular, enrolment rates have increased to unprecedented levels (Pritchett, 2013) as a result of groundbreaking achievements in schooling equity that deserve to be recognised. Morocco, for example, saw an impressive increase in girls' enrolment, equivalent to 54%, over the course of 11 years. By comparison, it took the United States 40 years to accomplish a similar feat. Meanwhile, in the 40-year interval between 1970 and 2010, the gross Primary enrolment rate skyrocketed from 68% in all of sub-Saharan Africa and 47% in South Asia to over 100% for both regions (World Bank, 2018).[16]

Remarkable gains such as these demonstrate a successful push from LMIC to match enrolment rates in high-income countries, which further demonstrates a universal emphasis on the importance of education. However, designated focus alone is not equivalent to improved rates of learning. The goal of universal education is not limited to the single criterion that all children within a given population are exposed to an educational institution; it also requires that the education provided by that institution is adept at equipping pupils with the necessary foundational skills for them to function as key members of a knowledge-based economy and lead fulfilling lives (Pritchett, 2013). This is what defines the current learning crisis — that an unprecedented number of children are attending school for longer periods, but are still not mastering the skills they need to excel. In this regard, nearly all education systems across LMIC have areas in which they must progress.

[16] A gross enrolment rate over 100% indicates that some children have enrolled in a grade who are over the official age of entry for that grade.

Distribution of Children Age 0-14 by Region, Enrollment, and Learning Status



b. Barriers to enrolment still persist nonetheless

Unconditional access to schooling is a crucial prerequisite for supporting global policy attention on improving education quality and efficacy. However, while rapid, worldwide increases in enrolment in recent history are cause for hope, global universal enrolment has not yet been reached, and there are myriad factors inhibiting its realisation. To better conceptualise the gravity of the situation, it may be considered that in 2018, 1 in every 6 Primary and Secondary school-aged children still remained out of school, which accounts for a total of 258 million children worldwide (UNESCO, 2023). The advent of the COVID-19 pandemic further exacerbated this situation: almost 1.6 billion children in more than 180 countries were kept out of school due to closures (Azevedo, 2020). Even after the prolonged period of sweeping closures ended, many pupils never returned to school. In some nations, dropout rates soared, with as many as 400,000–500,000 children in South Africa, 2 million children in Ethiopia, and 6 million children in India permanently leaving the education system between 2020 and 2021 (UNICEF, 2023; Mighati, 2022). Among them, the pupils who were disproportionately affected were those who had already been struggling academically, or whose families were facing severe financial hardships during this period (Kidman et al., 2022; UNICEF, 2023).

In this sense, quantifying the share of children who are not enrolled in school not only underscores the urgency of improving enrolment outreach as a necessary condition for improving education systems in LMIC, but it also begs the question of why this problem persists. In some contexts, access is a central obstacle. Across the globe, and particularly in rural areas, there are ‘education deserts’, where large shares of the population do not live within a reasonable distance from the closest school in order to be able to reach school. Additional factors, like impassable terrain or issues of travel safety, may exacerbate problems with physically accessing schools beyond distance alone. Furthermore, school construction meant to mitigate instances like these has not always been optimally efficient, in the sense that fewer schools would need to be built in a given area if they were more advantageously located relative to the locations of prospective pupils, though other constraints do not always allow for this.

Another restricting factor to equitable access is the financial burden to households. In contexts in which schooling is not free and/or compulsory, and even in those instances in which it is, school fees — even the relatively smaller ones associated with school uniforms, meals, or textbooks — presented barriers to entry for many prospective pupils and their families (Abdul Lateef Jamil Poverty Action Lab, 2019). In a current report, it was shown that an average of one-fifth of pupils in Nigeria — which has the highest absolute rate of out-of-school children in the world — gave their top reasons for inability to attend school as competing financial responsibilities/untenable cost and the too-far distance to school (Oyekan, 2023). Further evidence indicates that the issue is widespread. Across an array of LMIC studied in a 2021–2022 report by UNESCO, individual financial contributions to schooling costs accounted for a large share of each economy. On average, household spending on education amounted to 2.3% of countries' GDP (Global Education Monitoring Report Team, 2021–2). The implications of these findings are that hindrances to educational equity are prevalent, but there are actionable incentives — such as conditional cash transfers and merit-based scholarships — that governments can use to encourage enrolment among previously excluded pupils (Abdul Lateef Jamil Poverty Action Lab, 2019). In doing so, a greater number of children will have the opportunity to fulfil their potential via the benefits of education.

Often, however, the issue with enrolment is that the last mile is the hardest. Beyond physical, financial, and infrastructural barriers, the quality of education offered by school systems is a crucial factor for ensuring that children not only enter school, but also remain in and advance to the next levels of school. There is a significantly stronger likelihood that pupils will drop out of school or will not transition to higher grades or levels of education if they are not academically thriving (Pritchett, 2013). However, the responsibility of ensuring the scholastic achievement of all pupils falls on the education system, to a far greater degree than it is dependent on pupils' backgrounds or characteristics (OECD, 2012; Eble and Escueta, 2022). Ultimately, failure to ensure adequate pupil retention and attainment has negative implications for both parties. It is more costly for education systems to devote educational resources to pupils who must repeat grades or who ultimately withdraw from formal education, and, namely, high rates of dropout are equated with lower levels of productivity in the labour force, which is detrimental for individuals and whole societies alike (OECD, 2012; Patrinos and Psacharopoulos, 2018).

c. Access to education must be prioritised from the beginning of children's academic careers

It is often also the case that children enter school later than the intended age, which can have a profound negative impact on the rate at which they master skills during their academic careers, and, thus, how well they develop into adulthood. According to 2019 data, for example, 1.8 million Nigerian children were attending Primary school after the age of 11 years old (Sasu, 2022), while in the Democratic Republic of the Congo, nearly half of pupils (44%) begin school later than the intended age (USAID, 2018.; Global Education Monitoring Team, 2022). In a study conducted in Uganda in 2017, pupil ages in the last year of Primary school ranged from 12 to 22 years, and most pupils were 16 years old (Nath et al., 2017). In some contexts, late entry is the product of positive systemic changes that have broadened an education system's access (World Bank, 2020). While it is an undeniable step in the right direction to make schooling available to children who were previously barred from it, it is more advantageous, in the long term, for pupils to be equipped with school

readiness by matriculating into a learner-centred environment as soon as possible — ideally via early childhood development education (Sosu and Pimenta, 2023) — which plays a critical role in ensuring that pupils are able to keep pace with curricular expectations, therefore maximising their potential throughout their academic careers and beyond.

Yet, two-hundred fifty million children in LMIC were found to be developmentally at-risk, due in part to a lack of early learning programmes, in 2016, which is a number alarmingly similar to that of children found to be out of school entirely in 2019 (Black et al., 2017; UNESCO, 2019). Similarly, UNICEF (n.d.) states that developmental stunting of this kind affects 43% of the population under the age of 5. This indicates a prevalent, systemic issue that has not been improved upon at least in the last decade — an issue that starts with pre-Primary programmes and continues to hinder retention in later years of schooling across education systems. Still, low enrolment in early childhood education is a widespread phenomenon: Over 4 in 10 age-appropriate children, worldwide, were not enrolled in pre-Primary school in 2020, but the vast majority of countries do not include it in free and compulsory education (UNESCO, 2022). In order for children to succeed in their academic careers, it is imperative that they start with a strong foundation. Children at this formative stage of their cognitive development greatly benefit from a learning environment that places them on the appropriate path towards essential skill-building (Sosu and Pimenta, 2023; UNESCO, 2022). Education systems are further incentivised to make pre-Primary school access more equitable by the fact that it yields the highest return on investment compared to all other schooling stages, in addition to contributing to a more smoothly running Primary education system by preparing pupils to meaningfully participate (UNICEF, 2019).

While pupils should have the opportunity to enter school at the earliest possible stage in order to fortify their path to becoming lifelong learners, education systems must be ready to provide them with high-quality education via strong teacher professionalism and accountability, appropriately levelled curricula, and environments dedicated to learning. Evidence suggests that most LMIC are nearing their goals of universal access to schooling, but they must anticipate the influx of a greater number of pupils into their education systems and have strategies in place to accommodate them. Keeping enrolled pupils in school requires ensuring that they achieve expected levels of learning proficiency, and this is the most crucial next step for education systems in order to maintain their current progress and move from increasing schooling to increasing learning (Pritchett, 2013).

d. Literacy rates are used as a measure of education quality, but they fail to present a comprehensive picture of learning outcomes

Literacy, like enrolment, is often used as a measure of education access. Because this foundational skill underpins the pupil's ability to master content in all subjects and to properly function in everyday life, it is also highly studied as a barometer of the actual learning taking place in schools. On a global scale, literacy rates have dramatically increased — from 42% in 1960 to 86% in 2015. However, there are sizeable disparities in the percentages of the literate population within and across countries (Roser and Ortiz-Ospina, 2013), signalling that there is more work to do towards achieving universal competency in this regard. Furthermore, when using literacy as a model, research suggests that insufficient attention has been allocated to education quality in favour of efforts to expand education access (Pritchett, 2013; Nestour et al., 2022).

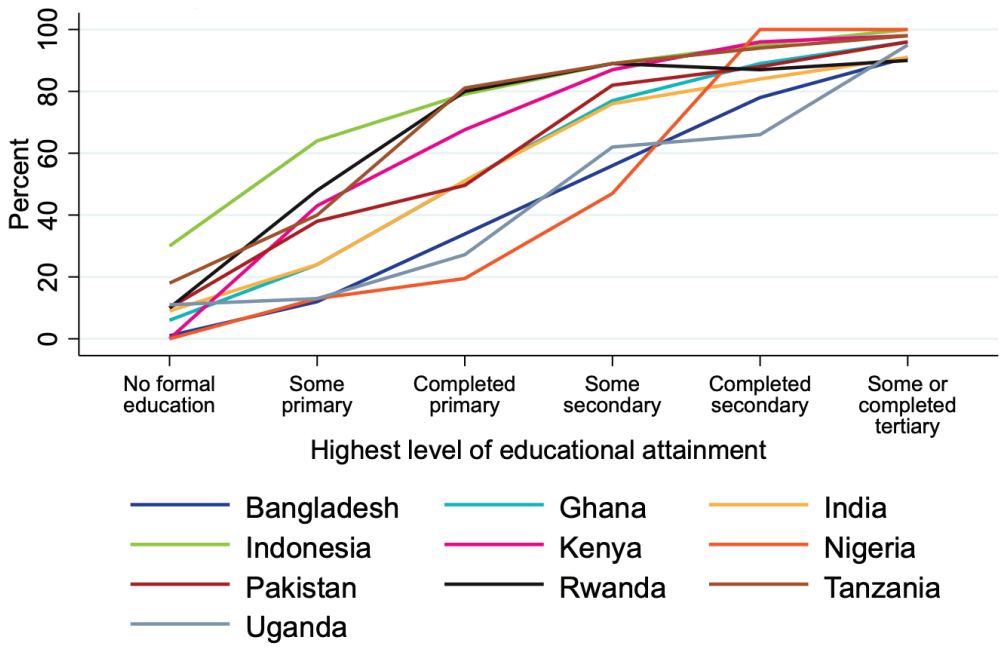
To provide a comprehensive understanding of the trajectory of education systems in LMIC, researchers (Nestour et al., 2022) conducted a study that included 86 countries, 39 of which were concentrated in sub-Saharan Africa. They isolated the growth of education quality from increases in access and measured this growth, using the likelihood that individuals would become literate after five years of Primary-level schooling as a proxy. Ultimately, researchers found that education quality had not improved in any of the evaluated LMIC in the last 50 years. For some, education quality had in fact declined over time, all while the drive for mass enrolment saw higher numbers of pupils entering formal education systems. Findings also indicated notable gaps in education quality not only among comparatively high-performing and low-performing countries, but within each of the countries as well (Nestour et. al., 2022).

The level of heterogeneity in literacy proficiency to this extent suggests that educational inequities exist in various magnitudes within and across the developing world. It is therefore clear that there is a need for implementation of standardised practices — tailored to the individual needs of each education system's context — in order to ensure broad and effective delivery of high-quality education. If the appropriate measures towards improvement are taken, literacy rates among all shares of the population will continue to rise.

e. Literacy rates in LMIC are often inaccurately inflated by variation in measurement methods

Differences in literacy rates can indicate varying levels of commitment to effectively implementing the necessary characteristics of well-functioning education systems. Taken together, these individual variations point to a large-scale deterioration of academic standards that then diminishes millions of pupils' opportunities for upward mobility. It is therefore important to consistently collect evidence on contextual literacy proficiency and use this evidence as a basis for applying learning-centric approaches. However, it is equally important to recognise that there are often significant disparities between reported literacy rates and the actual levels of learning achieved in schools.

Literacy Rates at Successive Education Levels, Selected Countries



Source: World Development Report 2018 Data

It is worth examining, then, what exactly constitutes literacy. Some definitions present it simply as a singular threshold to cross, rather than a heuristic model within which pupils should have the skills to navigate and grow. In this sense, the benchmark aligning with achievement may be too low. In certain cases, observing that pupils cannot meet or surpass a relatively lenient threshold in literacy can provide beneficial visibility into the extent to which these pupils require intervening instruction. Conversely, the evaluations may show that pupils are nominally literate, though they are far from achieving the ultimate goal of literacy: reading comprehension, which incorporates a variety of emergent subskills commonly featured on assessments, such as phonemic awareness and automatic decoding. Combining these contributing subskills into the ability to draw meaning from and apply the purpose of a text, however, is what elevates them from *learning to read* to *reading to learn*.

Before the need for improvement in this particular area of learning can be addressed, its rampancy must first be properly assessed. Currently, self-reported literacy rates across a number of nations reflect a level of optimism that does not match the levels of learning poverty. For instance, in sub-Saharan Africa, the illiteracy rate is said to be 24%, but 87% of children are in learning poverty (World Bank, 2018). In India, data compiled by UNESCO from individual and household reports concluded that the youth literacy rate was 92% in 2018, though India's National Statistical Office surveyed the average overall literacy rate to be approximately 74%. Meanwhile, more than half of children in India were estimated to be in learning poverty in 2019 (World Bank, 2019). From these examples, a clear pattern of dubious accuracy emerges, which will continue to impede educational improvements as long as it remains unremediated.

Moreover, the decision to make foundational literacy and numeracy skills the focal point of education improvement initiatives may be largely predicated on the extent to which policymakers across LMIC understand acute pupil deficiencies in these domains and the significance of remediation. To assess this, 931 interviews were conducted with officials in the sub-Saharan Africa and Asia-Pacific regions, which revealed a widespread overestimation of pupil proficiency in foundational skills. On average, policymakers estimated that double the share of pupils had attained foundational literacy than the actual proportion, which was determined by using the World Bank's Learning Poverty indicator (Crawfurd et al., 2021).

Additionally, the findings of this study have shown that there is an absence of urgency among policymakers to prioritise building foundational skills as the cornerstone of education quality programmes. While as many as four in five interviewed officials (79%) recognised that the learning crisis affected both their own country and the entire globe, only 2% regarded a foundational reading or literacy programme as the most significant, recent educational reform in their context. Further evidence showed that a positive official perception of pupil skills in foundational literacy and numeracy strongly correlated with reduced motivation to focus on this area of improvement. Therefore, the disparaging response to programmes strengthening core pupil competencies may be due to a falsely optimistic outlook on the state of learning that is, in turn, produced by a lack of visibility into consistent, accurate measurements of learning (Crawfurd et al., 2021). However, it is necessary that pupils in these contexts have verifiably mastered the most fundamental concepts before policymakers can address other goals in order to preserve education quality.

2. Learning Outcomes Are Weak and Urgently Require Transformative Interventions

a. Foundational literacy and numeracy skills are severely lacking among pupils in all levels of schooling, but especially in Primary grades

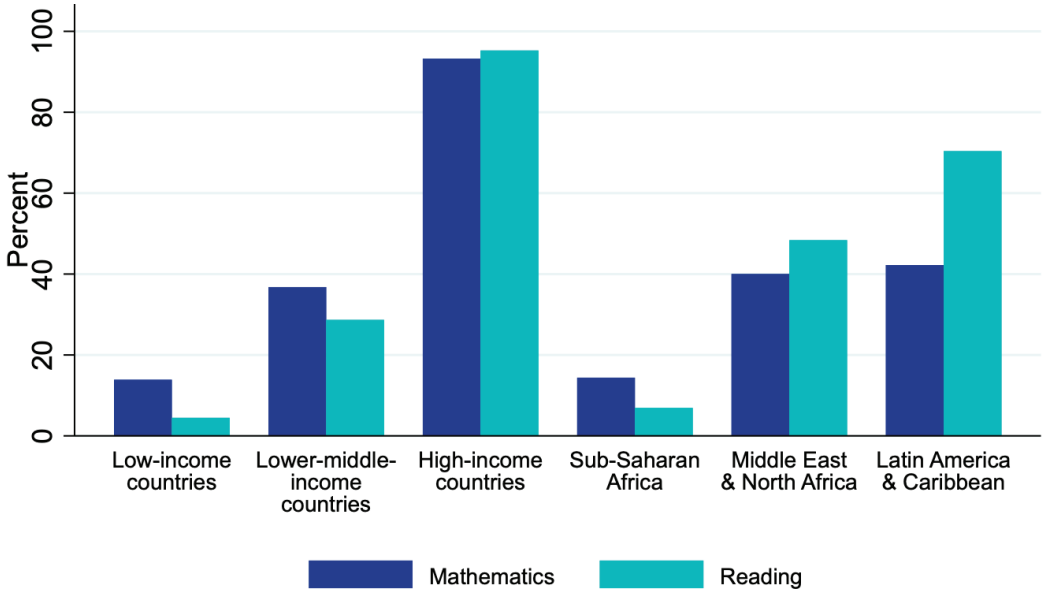
While ensuring that children have access to school, start school at a developmentally appropriate age, and stay in school for the expected duration is a massive undertaking, succeeding in any or all of these areas does not guarantee that pupils are receiving an education that will properly equip them for their future careers and daily lives. Learning, especially when it is not measured for efficacy, is not the natural by-product of school attendance (World Bank, 2018; Pritchett, 2013). In fact, myriad examples of persistently low learning levels exist in all LMIC, where over half of all children (53%) experience learning poverty according to the World Bank,[17] even while 40% of them are attending school. Furthermore, this regional average masks the extent to which learning poverty rates are especially dire, such as in sub-Saharan Africa, where it is estimated to be approximately 90%, and in the Middle East, North Africa, and South Asia, where 6 in 10 children do not approach expected minimum proficiency levels. These shortfalls in learning outcomes among enrolled pupils speak to insufficient education quality that will inhibit them from mastering increasingly complex curricular expectations, and may lead to their eventual withdrawal from school.

Literacy, the most extensively studied foundational skill, can also be examined among pupils in LMIC. Competency in this domain is essential for pupils to follow written directions, engage with learning materials, participate in assessments, and become knowledgeable in every core subject in school. However, evidence points to a widespread lack of proficiency in many of the fundamental, early-grade subskills that ultimately inform literacy. In rural India in 2016, for example, half of pupils were unable to read sentences in their local languages that were considered appropriate for a grade 2 curriculum. In another scenario, 80% of grade 2 pupils in Ghana and Malawi were unable to read a single familiar word, such as “the” or “cat”, during assessments conducted at the end of the school year. When using a three-sentence passage for assessment and reducing the defining characteristics of literacy to a relatively lower threshold,[18] 75% of pupils in Nigeria, Uganda, and Bangladesh did not qualify to be considered literate by the end of Primary school (World Bank, 2018). Therefore, despite the inherent understanding of the extensive advantages of literacy and the detrimental consequences of illiteracy, there is still a pervasive absence of proficiency in this foundational skill among pupils within and across education systems.within and across education systems.

[17] “Learning poverty” is defined as the inability to read and comprehend a simple text by the age of 10.
[18] “Literacy” was defined in this context as the ability to read either “fluently without help”, or “well but with a little help”.

Problematic literacy rates are mirrored by numeracy rates that could also significantly inhibit pupils' abilities to function in their daily lives. For example, 50% of all third graders in Uganda cannot solve simple subtraction operations. An even higher percentage, 69%, of third graders cannot complete double-digit subtraction in rural India. By grade 5, half of those third graders still cannot solve the same operations (World Bank, 2018). Similarly, only 60% of pupils in urban Pakistan could correctly perform double-digit subtraction by grade 3, and this percentage dropped to 40% for the same grade level in rural areas. The dearth of numeracy proficiency seen in these contexts extends to broader regions, as well. Across sub-Saharan Africa, the Middle East, and North Africa, for instance, the average share of pupils who score above the minimum proficiency level on a mathematics learning assessment is between 18 and 42% (World Bank, 2018). Therefore, while the specific interventions that must be implemented to elevate learning in foundational numeracy will vary based on an education system's independent context, the necessity to disrupt stagnating learning gains is clear.

Median Percentage of Students in Late Primary School Who Score Above a Minimum Proficiency Level on a Learning Assessment, by Income Group and Region

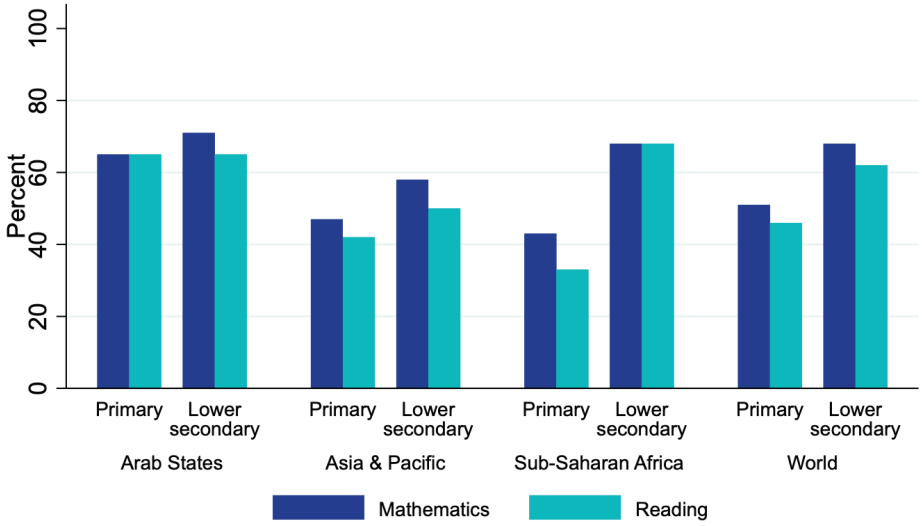


Source: World Development Report 2018 Data

Furthermore, without the implementation of effective policy solutions that drive improved learning outcomes, massive amounts of educational resources will continue to be expended without a meaningful return on the investment. On a global scale, for instance, 125 million pupils who have successfully completed 4 years of schooling do not have functional literacy or numeracy skills, demonstrating a widespread lack of recompense for schooling efforts. This will require targeted, transformative approaches to prevent the ongoing scarcity of learning, and to preserve the expected output of education funding — which has little room for deviation following the economic downturn incited by COVID-19 (United Nations, 2020).

To complicate the matter, one-third of 121 countries have also been found to lack the data required to report reading and mathematics proficiency levels among children (World Bank, 2018). However, it is pivotal that educational interventions operate with a data-driven core, to not only certify and track their efficacy within education systems, but to also benchmark pupils' progress against international standards, thereby ensuring that pupils are prepared to become globally competitive adults.

Percentage of Countries With Data to Monitor Progress Towards the Sustainable Development Goals for Learning by the End of Primary or Lower Secondary School



Source: World Development Report 2018 Data

B. Year-on-year improvement is too slow for pupils to keep pace with their better-positioned peers

As the evidence pointing to low worldwide learning levels implies, there is a profound need to determine the extent of under-education in foundational skills and target them from Primary grades upward. In addition to measuring the pupil learning gains that result from this educational reform, however, stakeholders must also measure the pace at which these learning gains are achieved in order to gain insight into their education system's global competitiveness and thus improve their rate of progress. Currently, data show that high-performing pupils in middle-income countries would be ranked in the bottom quarter in wealthier countries, while for many education systems in LMIC, the current rate of pupil learning will not result in globally comparable content mastery in a reasonable number of decades (World Bank, 2018; Pritchett, 2013). For example, a comprehensive number for the developing world estimates 50 years just to halve current learning poverty levels (Azevedo, 2020).

The implications of these findings are that there is a considerable risk of generations of pupils continuing to lag behind desired learning levels, but that essential rapid improvement on a large scale is attainable through interventions that positively overhaul learning outcomes. For example, if every LMIC in the world were to produce learning gains at a rate that doubles or triples their historical progress, it is possible to reduce learning poverty by almost half by 2030 (Azevedo et al., 2021), which is an 82% reduction in the counterfactual projection of time needed to meet this goal. Therefore, the critical dual objective of education systems in LMIC is to not only set precedents in learning gains achieved, but also in the pace at which they achieve them.

c. The COVID-19 pandemic led to significant setbacks in learning progress

The onset of COVID-19 has drastically increased the prevalence of weak learning outcomes across the globe. Not only did existing deficits in learning worsen in the years during and following the pandemic, but the resultant need for specialised systems that will overturn deteriorating learning from this global event also presents another obstacle to advancement for education systems that are susceptible to low performance. According to the most recent reports provided by UNICEF and the World Bank, the average pupil in a low-to-middle-income country spent close to two academic years (236 days) out of school (World Bank, 2023), and learning poverty in LMIC was estimated to increase beyond original estimates of 53% to as much as 70% — an increase that would signify three years of pandemic-related learning loss (Azevedo et al., 2022).

While longer school closures were correlated with a more pronounced decline in learning, the availability of distance learning technologies also played a significant role in pupils' ability to keep pace with academic expectations. However, in nearly all low-income countries, more than half of the population does not have access to the internet (World Bank, 2023). While other at-home learning models were employed by most LMIC that did not require internet connectivity — such as radio lessons, televised lessons, or take-home packages — these did not allow teachers to verify pupil engagement with lessons via observation, nor did they enable teachers to track pupil understanding of the subject matter while instructing (World Bank, 2023). In this sense, the tradeoff education systems faced when innovating distance-learning approaches to reach a greater number of pupils was the inability to manage these pupils' mastery of lesson content in real time.

As a result, many pupils across LMIC learned much less than they would have if participating in conventional, in-person instruction, and therefore, more pupils demonstrated lower learning levels from 2020 onward. In Brazil, for example, some pupils participating in at-home learning absorbed only 28% of the content they would typically learn in school (World Bank, 2023), and thus scored over 50 percentage points lower than projected in maths and nearly 40 percentage points lower in language on state exams administered in Sao Paolo in 2021. A similar scenario is observable in South Africa, where second- and fourth-grade pupils learned only an average of 25–41% of a year's worth of instruction during the pandemic. In India, more than half of second-grade pupils were already reading fewer than 10 correct words per minute (cwpm) prior to the onset of COVID-19, and this share increased by 42% in 2020 (UNESCO et al., 2021). This disruption to education interrupted the academic trajectory of pupils on a worldwide scale (United Nations, 2020), with the most significant consequences for pupils in early grades needing to master foundational skills and for those who were already struggling in their learning. In response, researchers and policymakers have offered and tested a number of solutions involving curriculum restructuring and small-group tutoring, among others, that aspire to reclaim a positive learning trajectory on an accelerated timeline (UNESCO et al., 2021).

To ensure the effectiveness of these solutions, however, it is worth examining how the COVID-19 pandemic hampered the performance of teachers and school leaders, who also experienced significant disorder to the typical execution of their roles. Many teachers did not have access to in-service training relevant to the hard pivot to remote-learning modalities, which would be exacerbated by a pre-existing lack of professional development in regions like sub-Saharan Africa, where more than a third of teachers (36%) had not received training (United Nations, 2020). Across all studied LMIC, two out of three teachers did not receive any special training (68%) in the first seven months of school closures, while nearly half of teachers (48%) had not been trained in the specific use of online platforms for instruction during the initial three months of school closures (UNESCO, 2020). Beyond training in this regard, an outright lack of technological devices and internet connectivity in LMIC impeded teacher participation in remote learning to a similar extent that it affected pupil participation in these countries, as only 19% of teachers were provided with ICT tools or internet connectivity (UNESCO, 2020).

Furthermore, UNESCO data (2020) show that the school personnel required to continue working was commensurate with the proportion of teachers required to continue teaching in LMIC. However, the evidence (UNESCO, 2020; Vegas, 2020) showing a general lack of support for teachers in these contexts calls into question the extent to which class-time observations by school monitors and teacher performance evaluations were severely limited, if not altogether impossible, during the pandemic, especially depending on the distance-learning methods employed by education systems. This, coupled with the financial hardships endured by many teachers, could have contributed to higher rates of absenteeism — which was already pervasive in LMIC — and a greater number of teachers leaving the profession altogether during and following the pandemic (United Nations, 2020).

In this sense, teachers need the support of impactful tools and resources, and the motivation of effective leadership, in order to implement systemic changes to education systems in their classrooms, which pupils will require to overturn the severe learning losses incurred in recent years. Education systems in LMIC, which already faced a learning crisis prior to the advent of COVID-19, are now further incentivised to unite key stakeholders in introducing transformative interventions that will standardise high-quality learning opportunities for all pupils.

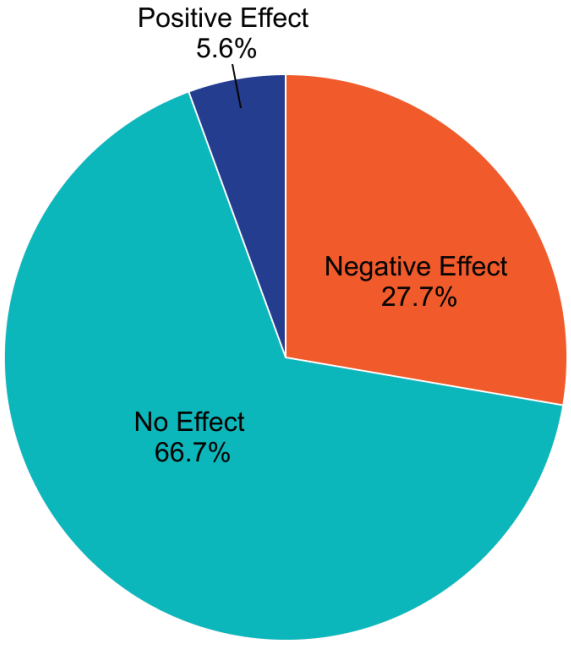
3. The Causes for Weak Learning Outcomes Are Many

a. Visible input-based policies are heavily relied on, but their effectiveness is dubious

Although the ongoing challenges to education systems both during and following the COVID-19 pandemic are severe, there are more global resources currently dedicated to education than ever before. This has created a path for policy interventions to often focus on input-based solutions when education systems are not meeting quality standards. A lack of tangible resources like paper, textbooks, or technological hardware in some schools, for example, have been looked at as hindrances to elevating learning. This is a worthy concern, in some cases. For instance, one study found that less than half of all pupils in Niger and Nigeria had paper to write on, while there was only 1 maths textbook for every 66 pupils in Togo (World Bank, 2010–2014). Such inconveniences can bog down the learning process when instructional efficiency is of the utmost importance. In this sense, inputs are necessary to a degree, but they are not nearly sufficient as a standalone improvement effort.

Furthermore, while targeted, scaled investments in education are needed to improve learning outcomes, misguided efforts to enhance schooling can have the unintended consequence of exacerbating already-problematic learning levels. If the specific factors inhibiting learning gains in a school have not been identified or had resources allocated specifically to them, indiscriminate expenditures on ostensibly beneficial changes may have little effect, while existent problems persist. In other words, the mere injection of materials into sparse classrooms has not been shown to result in higher levels of academic achievement, and may even function as a detractor. In 2008, for example, textbooks distributed to Sierra Leone were discovered unused in a cupboard during a follow-up inspection. Speculations indicate a hesitancy to risk damaging a resource such as these when they are a rare classroom feature (World Bank, 2018), but a lack of use in this regard is a lack of advantageous potential for pupil learning, and signifies non–cost-effective spending on education improvement.

Distribution of the Effects of Hardware Education Technology on Student Learning



Source: World Development Report 2018 Data

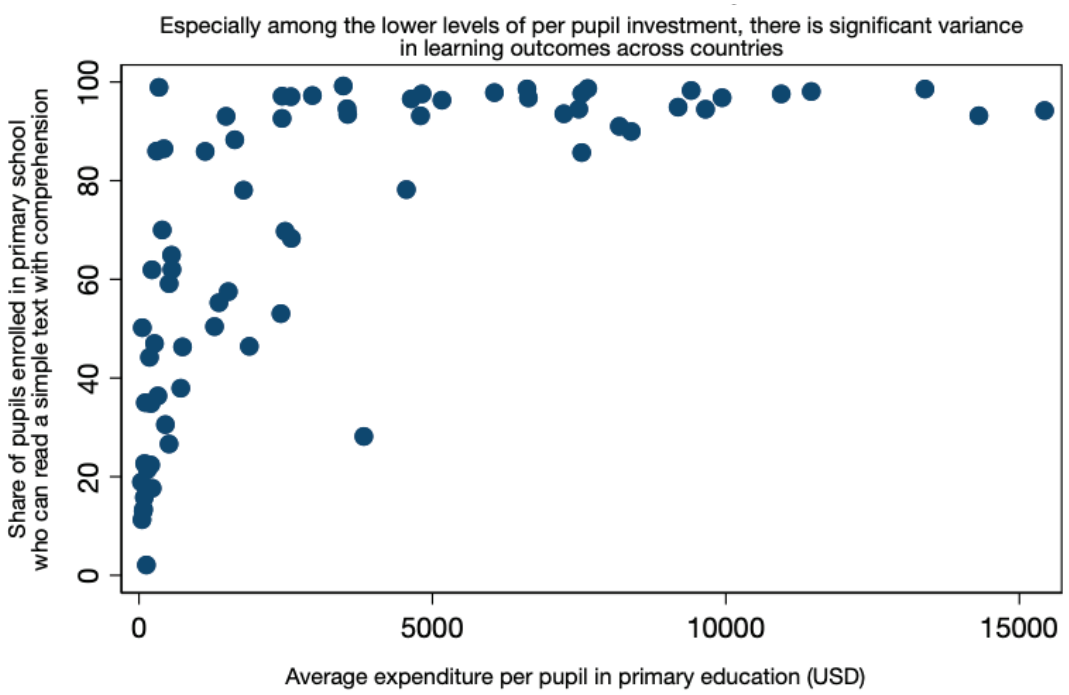
Another, more far-reaching example is the One Laptop per Child (OLPC) initiative, which was a lofty aspiration to enhance learning via technology access in 42+ countries (Yanguas, 2020). One year after successful distribution, however, almost half of teachers reported rarely or never using the laptops in the classroom (World Bank, 2018). A variety of studies across parts of the developing world conveyed neutral or negative results stemming from OLPC on academic outcomes. In some cases, pupils were spending more time on their computers, but less time on independent study or other learning-based activities (Meza-Cordero, 2017). Further evidence aligns with these findings produced from the OLPC initiative, showing that the introduction of edtech hardware only has a 6% positive effect on pupil learning, while the other 94% of the effect on pupil learning is neutral or negative. In response to this, it is imperative for education systems in LMIC to parcel out and maintain momentum with proven-effective approaches, so that gaps in educational achievement do not widen during side-tracked pursuits. Furthermore, curricular design should justify how and why material or technological inputs are used. These resources must fortify pre-existing teacher-learner relationships as a complementary additive, not a substitute (World Bank, 2018).

To accomplish this requires ensuring that resources used by education systems in LMIC are supported by evidence of their confirmed impact on learning gains, which, in turn, ensures that investment in them is cost effective. Framed differently, policy decisions about which resources are allocated to these education systems, and for what purpose, are more pivotal than the amount of resources that are allocated, above a certain threshold. This concept becomes more clear when examining a distribution of per-pupil expenditures across countries, which also shows a large range of learning outcomes. In the majority of these contexts, high literacy rates exist alongside relatively high per-pupil expenditures, but this is not a causal relationship. Firstly, It's important to highlight that numerous assessments indicate that high-income countries that have achieved exemplary — or at least, satisfactory — learning outcomes have consistently maintained these outcomes for three-quarters of the past century. Therefore, these countries do not have the same goal of positively overhauling the quality of their education systems as LMIC do (Pritchett, 2013). Furthermore, the value brought to high-income countries' economies by the stronger knowledge base of their citizens contributes to their ability to funnel comparatively larger portions of their budget back into education systems, resulting in higher per-pupil expenditures that largely perpetuate existing learning levels.

Secondly, there is considerably more variation in learning outcomes when expenditures are below approximately USD 5000. In this sense, poor learning outcomes do not directly correlate with low per-pupil expenditures. Instead, this variation highlights the possibility and importance of prudent monetary allocations towards initiatives that can transform education quality, which do not need to come at an untenable cost. In these contexts where per-pupil funding availability is low, there is also increased risk of regression or stagnation in learning resulting from misallocated expenditures, however. For this reason, cost-effective approaches to transforming education in LMIC must be supported by strong evidence of their effectiveness. Increased investments in education by currently low-spending countries will produce improved learning outcomes for generations of pupils, who will in turn contribute to the economic growth of their countries.

Overall, the basis for allocating educational resources must be steered away from prioritising high visibility and instead be directed towards strategies that will yield measurable results. This is the necessary starting point for whole education systems and the pupils they serve that require a strong learner-centred foundation prior to the accumulation of conspicuous academic inputs. These education systems must, first and foremost, leverage their existing and essential components to facilitate better stakeholder performance and establish a resilient learning environment.

Although Investment in Education is Correlated with Learning Outcomes at a National Level, How the Funds are Actually Invested also Matters:



b. Low teacher content knowledge can translate into poorly executed pedagogy

Teachers are at the core of what can be accomplished in any given classroom, and are the single-most influential input across all education systems (Vegas, 2020). The level of competency they possess in professional aptitudes and their cultivated rapport with emerging learners are what equips them to assess learning levels and aid pupils in fulfilling their academic potential. In some instances, though, teachers in LMIC may lack the content knowledge necessary to sufficiently coach struggling pupils. In 14 sub-Saharan African countries, for example, teachers performed at the same level on reading tests as their highest-performing grade 6 pupils (World Bank, 2018). Similarly, in India, two-thirds of teachers (66%) could not correctly solve a grade-5 maths problem. Studies suggest that these deficiencies in teachers' mastery of subject matter can have negative implications for pupil achievement. In some contexts, as much as a third of pupils' inability to meet curricular expectations (30%) was found to be due to a lack of teacher content knowledge. Findings such as this are corroborated by evidence showing that large proportions of teachers in Kenya and Togo could not accurately correct at least 80% of pupil answers on a fourth-grade mathematics test — therefore demonstrating an inability to evaluate whether pupils are learning or to guide pupils towards that goal (Brunetti et al., 2021).

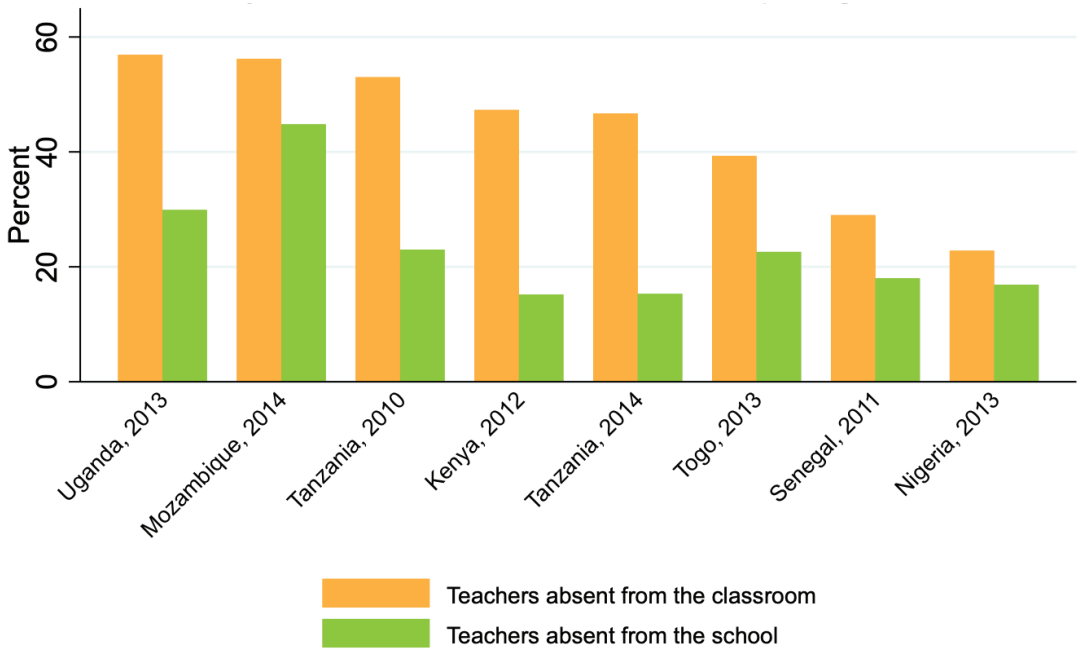
This may lead teachers to cater to higher-performing pupils in order to maintain instructional flow, or to push through the curriculum without identifying areas in which pupils need more support. These would be in direct contrast with the classroom approaches that pupils often need most to succeed, like ability-grouping, and can encourage pupil dropout (World Bank, 2018). To examine the issue more closely, a variety of studies have assessed the extent to which teachers are lacking pedagogical skills. The World Bank's Service Delivery Indicators report indicates, for example, that the average teacher in Indonesia scored only 25% on a pedagogy assessment in 2019 (World Bank, 2020), while the average teacher in Madagascar in 2014 scored only 23% on pedagogy assessments (Wane and Rakotoarivony, 2017). In Pakistan, among Primary-school teachers who were evaluated on a number of pedagogical skills in areas like lesson facilitation, checks for understanding, and fostering critical thinking using the TEACH tool, almost two-thirds of teachers (63%) achieved scores between two and three out of five, with the most teachers earning the lowest scores in the areas of fostering critical thinking, feedback, and social and collaborative skills (Molina et al., 2020).

However, the consequential link between poor content knowledge and unsatisfactory pedagogical performance provides policymakers with the opportunity to address both shortfalls simultaneously. Solutions like structured pedagogy can provide teachers with expertly researched lesson content that will not suffer from low levels of teacher expertise in subject matter, and include essential techniques, like scaffolding, that ensure the teacher properly paces dissemination of the lesson with pupils' ability to achieve mastery of foundational concepts.

c. Strong governance is essential for encouraging teacher professionalism and accountability

Regardless of whether teachers possess ideal levels of content knowledge and pedagogical best practices or not, it is irrefutable that teachers must value professionalism and accountability to be effective. For that to happen, they must be bolstered by effective governance administered by informed policymakers. However, evaluative reports suggest that these crucial pieces are not always in place. Across eight African nations studied between 2010 and 2014, for example, teachers were often absent from their classrooms, or from school entirely. In Mozambique, Uganda, and Tanzania, the amount of time teachers were absent from school was close to or more than 50% (World Bank, 2018). Absenteeism to this extent reduces actual instructional time from that of a typical school day to approximately two to three hours per day, on average. Instructional time is further compromised by teachers who are present interrupting their class time to check in on other classrooms that are unsupervised due to absenteeism and a lack of substitute coverage (Bashir et al., 2018; World Bank, 2018). Teachers who must integrate these unattended pupils into their own class are forced to dilute the benefits of ability-grouping and disrupt the appropriate scope and sequence of academic content by imparting it to those for whom it was not intended.

Percentage of Teachers Absent From School and From Class on the Day of an Unannounced Visit, Participating Countries



Source: World Development Report 2018 Data

Effective school-monitoring practices are what is required to mitigate high rates of absenteeism across LMIC, but these are not always effectively leveraged for incentivising teacher or whole-school compliance with consistent attendance. In Tanzania, only 30% of schools reported that a recent visit from ministry of education officials was related to teaching and learning. Across a number of public schools sampled in India, not one of the teachers with a high number of absences had been dismissed by the principal during their tenure (Mbiti, 2016). Additionally, according to UNICEF's Time to Teach Study, school leaders in a number of West and Central African contexts did not issue sanctions against frequent absenteeism due to confusion about the education system's hierarchy or a lack of faith that corrective action would be taken (Karamperidou et al., 2020).

However, regular observation by school leaders and the introduction of programmes that tie professional benefits for teachers directly to academically constructive behaviours can result in reduced absenteeism and time off task, which, naturally, carries positive effects for pupils. In public schools studied in India, for example, there was a 25% decrease in overall absences and a 40% decrease in unauthorised absences when regular school inspections were conducted (Muralidharan et al., 2017). In another study, learning outcomes were improved by way of better teacher attendance when teachers in India were financially incentivised to take time-stamped photos with their class at the beginning and end of the school day (Mbiti, 2016). In addition to facilitating their most desired effect — a positive impact on pupil learning gains — initiatives like these can set expectations for education professionals that not only improve current situations, but also carry into the next generations of incoming teachers.

The issue of teacher shortages extends beyond frequent absences, especially when considering daunting pupil-teacher ratios across South Asia, the Middle East, and Africa. These range from 35:1, on the lower end of the spectrum, up to 90:1 (World Bank, 2018). While this can significantly constrain the teacher to devote more time to classroom management tasks than instruction, which has been found to detract from pupil achievement (Molina et al., 2020), hiring more teachers to reduce class sizes in western Kenya, for example, did not correlate with improved teacher performance. Instead, the increase in the number of staff reduced the sense of urgency and personal responsibility felt by teachers to optimise their instruction. Although it was intended to provide more capacity for differentiating instruction, the expansion of staff was not accompanied by regular teacher observation and constructive coaching. Therefore, it led to a diffusion of responsibility among teachers and failed to account for other priorities these teachers may have had, which was evidenced by a significant portion who shifted their focus to seizing employment opportunities for relatives (Mbiti, 2016).

A critical aspect of ensuring the optimisation of pupil learning opportunities through teachers is to ensure that teachers are adequately supported by the education systems in which they operate. This support should come in the form of relevant, consistent in-service training, as this is a critical component for professional performance that many teachers do not receive (World Bank, 2018). In 21 studied countries across the globe, for instance, between one-third and more than one-half of Primary-school teachers were not trained according to UNESCO's 2017 data, and the quality standards that define training differ among these countries (Montoya, 2019). Many teachers also grapple with heavy workloads that include administrative responsibilities not related to instruction, and a dearth of teaching and learning materials to aid them with meeting expectations for their instruction. On these fronts, non-teaching education personnel can also benefit from receiving professional development that better equips them to manage schoolwide responsibilities and provide coaching to teachers. The use of structured pedagogy can alleviate the burden on teachers preparing their own lesson plans when they do not have time to design them well, or design them at all.

d. Important considerations for effective policymaking in developing education systems

The joint performance of all stakeholders in an education system is pivotal for fostering pupil success, and is equally capable of undermining said success. The latter is especially plausible when policymaker decisions do not properly leverage all components of the education system towards achieving a clear objective of enhanced pupil learning. Yet, policymakers seeking to enact change for learning-deprived schools can be inhibited by an absence of metrics providing necessary insight into the state of learning, and may therefore lack the context with which to make viable recommendations. This insufficiency of actionable data is widespread in the parts of the world where such data are needed most. World Bank research has attested to the fact that the vast majority of the countries that represent the global population are low- and middle-income countries, which have historically lacked assessment results that reliably compare learning outcomes on an international scale, but also have the most room for growth in terms of education quality (Angrist et al., 2021). Therefore, it is essential that the decision-making process for improving education quality begins with the system-wide collection of robust, regular measurements of the state of learning.

Even in instances when evidence of pupil performance is available, policymakers may be inclined to abide by the falsely representative or misleading optics it can present. If, for instance, pupils who were identified as the lowest performing at a given point in time withdraw from school in higher proportions than mid- to high-performing pupils, subsequent assessments will appear more favourable on average, but learning gains will not have improved (World Bank, 2018). In this sense, regulatory stakeholders may more accurately gauge the success of the education system by examining the participation and performance trends of these low-performing pupils. From a broader perspective, it should be recognised that sectionalised data points are not solely representative of an education system's learning-centric achievements. Rather, the effectiveness of its strategies must be observable in all measures of accountability.

In an ideal case, struggling pupils would be equipped with the necessary tools to strengthen their capacities and grow towards keeping pace with their higher-performing peers. A significant hindrance to achieving this goal is that the facilitation of learning gains among low-performing pupils may not be well-integrated into the academic framework of an education system. Evidence points to curricular design that, in many cases, favours top-performing pupils rather than the median pupil (Mbiti, 2016). Research further suggests that overly complex, fast-paced curricula in LMIC are a deterrent to all pupils' learning (Pritchett and Beatty, 2012), despite being implemented with the intention of setting rigorous expectations for academic achievement. In response to this, policymakers should adopt a gradational approach by first familiarising themselves with the curriculum in a given education system, and then taking the steps necessary to understand if, how, and why certain pupils are not keeping pace with it, while incorporating the pedagogical factors that will foster achievement in that system's particular context. In doing so, the policy will focus on targeting pupils at level, thus allowing them to master the foundational content on which they will build schema that will translate into cumulative mastery.

Teachers can collaborate with policymakers to accomplish the goal of elevated pupil learning via a multi-tiered feedback structure. Such a structure begins with formative assessments conducted in the classroom, which allow teachers to identify struggling pupils, and expands to national assessments and examinations, which provide insight into the functionality of the education system as a whole, and international large-scale assessments (ILSAs), which evaluate the effectiveness of education systems across countries and over time (World Bank, 2018; Rocher and Hastedt, 2020). In turn, the broad reforms education leaders introduce by discerning core effective principles from this host of information sources will ultimately return the benefit to classrooms and teachers.

Importantly, policymakers and education personnel alike should be prepared to recognise that reforms targeting pedagogical improvement and increased accountability are not always as conspicuous as input-based policy changes or efforts to increase enrolment and attendance. Nonetheless, the appropriate interventions have the ability to drive unprecedented learning, which is the strongest indicator of any initiative's effectiveness. As Rukmini Banerji succinctly summarises it, "Discussions focused on learning are neither easy nor automatic" (Mbiti, 2016). Furthermore, while policies may be adapted for a given education system based on their replicated success in other contexts, it is imperative that education leaders investigate the nuances of the selected education system, in order to ensure that policy implementation is scalable, cost-effective, and aligned with the most urgent learning needs.

4. The Case for Solving the Learning Crisis Through Targeted Investment in Foundational Skills and Beyond

a. The projected economic consequences of low education quality far outweigh current investments in education, but there is potential for substantial economic gains through improved education

Pupils with strong learning outcomes are more likely to achieve higher educational attainment and are subsequently more productive and fulfilled when operating within the labour market. For example, research conducted by the World Bank in 2018, based on observations in 139 countries, found that there is a 9% average increase in wages for every additional year of schooling that an individual receives (Patrinos and Psacharopoulos, 2018). However, the inverse of this situation also applies. Pupils who are currently learning deprived stand to lose a collective 10 trillion USD in potential labour earnings over the course of their working lives, which will have a broader detrimental impact on the economies in which these former pupils live and work. Foregone earnings of this magnitude are equivalent to one-tenth of the global GDP, and are twice the global annual public expenditure on Primary and Secondary education (Azevedo, 2018). Additionally, comprehensive research conducted in 2022 via the RISE programme shows that pupil performance deficits will lead to the loss of 700 trillion USD from the global economy by the year 2100 (Gust et al., 2022). Therefore, the enormity of financial losses that could be incurred as a result of education systems that do not meet the needs of the global pupil population is clear, which not only precludes those pupils from personal prosperity, but also detracts from opportunities to invest in education for the generations that follow them.

Still, it should be recognised that the current amount of funding being devoted to education quality improvement is significant. On average, 14% of worldwide government expenditures are devoted to education, according to USAID (2018), and an average of USD 5 trillion is spent on education every year across the globe. A UNESCO report calls for an additional USD 500 billion of yearly education funding from low- and middle-income countries, specifically, to reach SDG 4 by 2030 (2022). While these amounts pale in comparison to what is forecast to be lost if low learning levels and resultant high rates of school dropout continue, it is possible to achieve higher returns on these investments by ensuring that they are strategically allocated to reforms that have been proven effective in elevating pupil performance, which will in turn contribute to pupil retention. Therefore, concerted effort towards solving the learning crisis is the foremost proposed action to ensure the cost-effectiveness of education funding and increased opportunity for sustaining these investments over time.

b. Supporting cognitive development in childhood is critical for ensuring a competent knowledge base in adulthood and facilitates improved pedagogy in classrooms

Missed learning opportunities early in life can have a stunting effect on pupils' learning trajectories as they progress through their education careers. Though the brain continues to adapt to its environment and foster learning throughout life, it functions best when given a strong foundation during childhood on which to sequentially build in increasingly complex ways. In other words, pupils who lack mastery of fundamental content from the early grades onward are at a greater risk of making detrimentally slower progress due to the cumulative nature of learning, which is particularly consequential in a finite formal education period (World Bank, 2018; Eble and Escueta, 2022). The negative effects of foregone childhood learning are compounded by the fact that the synapses responsible for forming sensory pathways, understanding language, and performing higher cognitive function gradually plateau as children approach early adulthood. For these reasons, a strong skills base is essential for supporting the pursuit of an intensifying, comprehensive education that adequately prepares graduates for participation in larger society (World Bank, 2018).

There is further evidence to support the idea that foundational skills constitute a pivotal building block that encourages pupils' academic success. A series of observations conducted by researchers (Hwa and Duong, 2021) in high-performing classrooms led to some major conclusions about effective teaching and learning. One of these was that foundational skills should be treated as opportunities to learn more advanced knowledge. It was found that ensuring mastery of fundamental concepts in this way provides more advantage for pupil learning, according to this study, because it allowed teachers to connect new concepts to those previously learned, and to eliminate rote memorisation in favour of more meaningful practice. Via this approach, pupils develop a greater capacity to acquire and retain a broader scope of knowledge throughout their education careers. What is troubling, though, is that there are still many examples of curricula in LMIC that do not prioritise pupil mastery of foundational literacy and numeracy subskills, which will ultimately hinder pupil participation in subsequent tiers of instruction.

Conversely, pupils who are able to engage with and apply foundational skills are better equipped to develop metacognitive thinking from the earlier grades onward. Those pupils who were encouraged by their teachers to analyse their own learning process tended to display better learning performance and expressed more interest in learning, according to the study (Hwa and Duong, 2021). Therefore, the benefits of encouraging cognitive development via a learning-centric environment compound over time and permeate throughout an education system by allowing teachers to refine their instruction and granting pupils the agency to actively contribute to their own educational achievement, which ultimately results in more high-yielding classrooms.

c. Elevating education quality standards drastically improves educational equity

It is often the case, across LMIC, that pupils from relatively disadvantaged socioeconomic backgrounds display lower performance in foundational literacy and numeracy competencies, in addition to being less likely to remain in school for the duration of or following their Primary school careers. These disparities increase over time, which highlights the necessity of early interventions that create equitable learning opportunities and foster gains for pupils from all wealth groups (DHS, 2014, 2015–16; Spaull and Kotze, 2015). Research indicates that improving pupil mastery

of foundational skills in an education system, regardless of the disparate socioeconomic statuses present in the classroom population, narrows gaps in academic performance — which have been attributable to differences in pupil background characteristics — by providing the appropriate substructure pupils need before becoming exposed to more rigorous concepts (Crouch et al., 2021; Asim, 2020). The implication of a narrowing learning divide, furthermore, is that a greater number of pupils become important contributors to a knowledge-based economy from which they otherwise would have been excluded.

Further evidence suggests that even in instances of severe socioeconomic disadvantage, pupils' demand-side characteristics are neither a determinant nor a deterrent of their level of educational achievement to the extent that the supply-side characteristic — the level of education quality — is. Put plainly, children who are motivated and supported by their households to learn still do not develop crucial foundational literacy and numeracy skills after years of schooling when education quality is poor, while the converse is not true — that is, a lack of fortifying inputs in the households of these children does not detract from their ability to learn at a sufficient pace and to a commendable degree when the quality of education available to them is improved (Eble and Escueta, 2022). In this sense, devoting education resources towards achievement of foundational skills raises performance standards for all pupils, and therefore promotes the upward mobility of all citizens in a society.

d. Education systems must be improved holistically

Optimising investments in education necessitates the alignment of whole education systems towards the common goal of producing learning in foundational skills and beyond. Given that education systems are composed of distinct components — teachers, pupils, school infrastructure, school leaders, and so on — reform initiatives are often oriented towards adjusting the quality or performance of one of these components to better match the patterns of those observed in high-functioning education systems (Pritchett, 2013; Spivack, 2021). However, approaches like this fail to consider a critical piece of education systems, which is that their components interact in specifically defined ways. Moreover, these relationships between these systematic elements both elucidate and enforce the objective of the entire education system (Spivack, 2021).

When the objective of one component of the education system is misaligned with those of the system as a whole, or when there is no clear objective being carried out, education quality and learning outcomes suffer (Kaffenberger, 2021). It is not simply the individual components of the education system that must be adjusted in response to this; the processes by which they either support or compromise one another must also be evaluated and shifted towards greater effectiveness in driving meaningful learning.

In recent decades, education systems across LMIC have centred themselves around making schooling more accessible for all children, in order to increase enrolment and attendance, and have achieved widespread success in this regard (Spivack, 2021). In order to address the current, pressing need to increase the learning levels of pupils — which is not only pivotal for maintaining high enrolment and attainment rates, but also underpins a pupil's ultimate ability to carry the benefits of their academic careers into the rest of their lives — education systems must be similarly aligned with comprehensive accountability and unified coherence.

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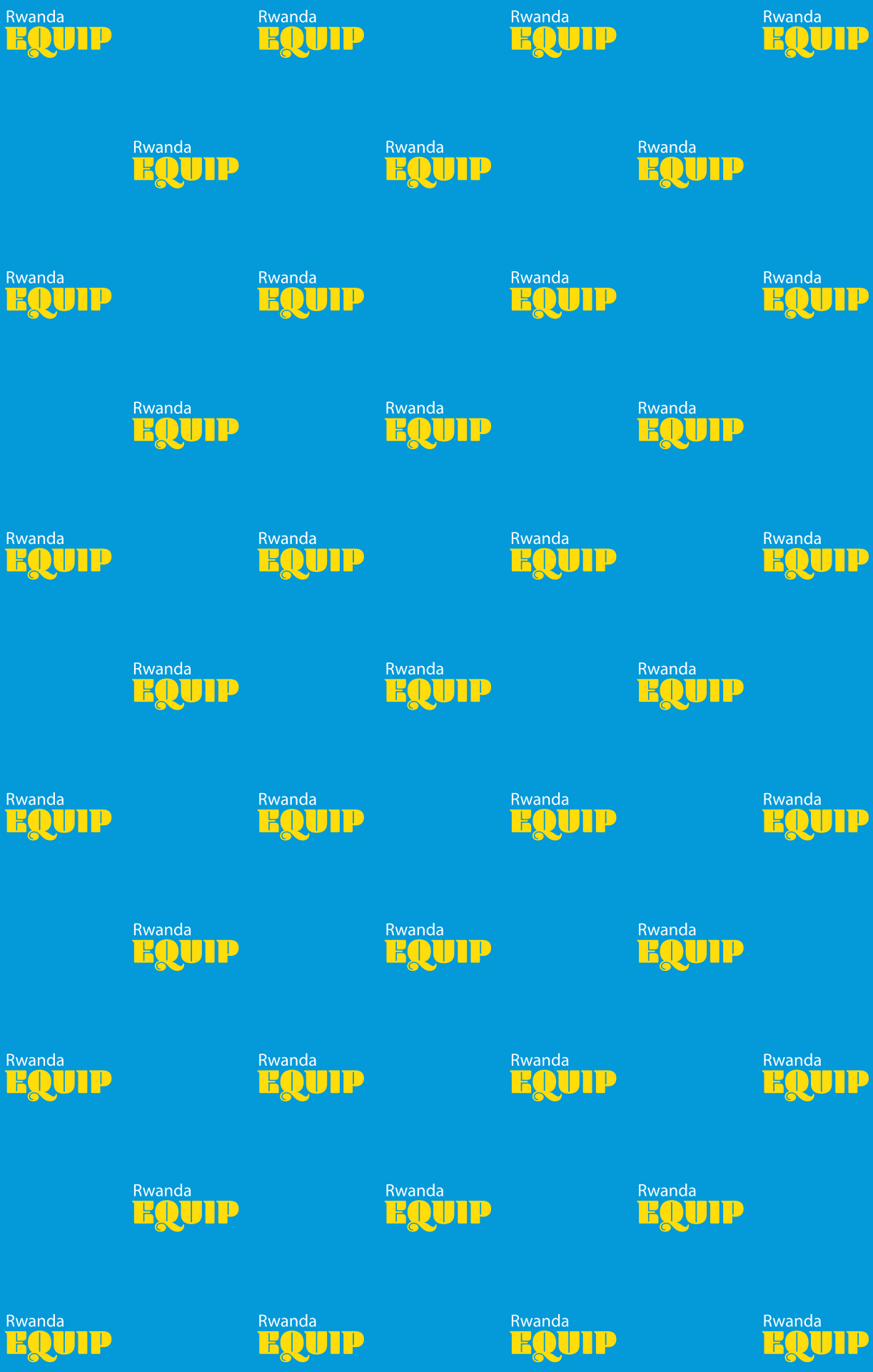
Notes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