BASIC EDUCATION SECTOR TRANSFORMATION

An Edo SUBEB Initiative

Can Data-Informed Management and Structured Pedagogy Improve Learning?

Evidence from Government Junior Secondary Schools (JSS) in Edo State

by the end of the 2022–23 school year after 46 weeks of programme implementation

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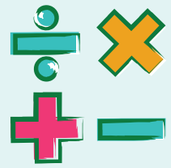
Executive Summary

The public JSS system was facing a learning crisis prior to the EdoBEST programme. This is despite the success achieved by EdoBEST in Primary schools, without which incoming students would likely display even more dire learning levels. For instance, in March of 2022, the average JSS student was reading fewer than 70 correct words per minute from a JSS1-level passage. Furthermore, half of JSS students could not correctly perform two-digit subtraction problems with carrying such as ‘78-29’, even though this skill should have been mastered by Primary 2 according to NERDC curriculum standards.

The EdoBEST programme expanded to Edo Junior Secondary Schools (JSS) in February 2022. As of October 2024, it serves over 1,200 schools and 300,000 children across Edo Primary, Progressive, and JSS.

In just one year, reading fluency rates in EdoBEST JSS significantly improved. JSS 1 students in July 2023 read 21 cwpm more than they would have in July of 2022. In addition, reading comprehension scores among JSS 1 and 2 students are 52% (12 percentage points) higher than they were.



Maths scores have increased as well. With one full year of EdoBEST instruction, JSS1-2 achieved an average gain of 10 percentage points overall on the ICAN+ numeracy assessment and gained between 4 and 19 percentage points on challenging maths sub-tasks such as: fractions, division, and algebraic equations.

There were also significant improvements in the quantity and quality of instruction. Teacher attendance rates doubled compared to the start of the programme, meaning that teachers who were once absent more than half the time are now present 86% of the time. Concurrently, lesson completion rates have risen 15 percentage points, equivalent to a 52% improvement since the first term of EdoBEST JSS.

The EdoBEST JSS programme is more effective than what is typically seen in the majority of educational interventions in low- and middle-income countries (LMIC). The programme’s impact on reading fluency (0.32 SD) means that EdoBEST is more successful than 85% of akin education initiatives. In mathematics, the EdoBEST programme’s impact is even greater, with an effect (0.57 SD) that places this programme in the 95th percentile of education interventions studied in LMIC.

In Numbers...

32%

increase in JSS 1 reading fluency during the 2022-23 academxic year: JSS 1 students are now reading 86 cwpm on average.

2x

increase in teacher attendance since the start of the programme: total instructional time has increased, improving returns on educational investments.

10 **percentage points**

gained on overall numeracy scores from July 2023 to July 2024: students even showed improvement on more advanced topics such as fractions and algebraic equations.

50%

higher reading comprehension scores: the average student in JSS is now scoring 14 percentage points higher than before the programme.

Glossary

Key Terms

absenteeism	When either a pupil or teacher fails to report for or remain at school as scheduled, regardless of reason.
automatic decoding	The ability to rapidly, effortlessly and accurately recognise a written word upon seeing it (Pikulski & Chard, 2005).
baseline	The conditions existing prior to an intervention or at the beginning of a period of time, against which changes can be measured, monitored, and evaluated (OECD, 2022).
benchmark	A reference point or standard against which outcomes can be assessed, established based on comparable data, or what can be reasonably inferred to have been achieved under a similar set of circumstances (OECD, 2022).
chronic absenteeism	When a pupil repeatedly fails to report for or remain at school as scheduled, leading to a significant negative impact on academic performance relative to their peers. The threshold for “chronic” absenteeism is not always clearly defined. In some high-income countries such as the US, a pupil is deemed to be ‘chronically absent’ when they miss 10% or more of the school year (Lara et al., 2018). However, this definition does not necessarily extend to other systems. Given that attendance rates and expectations are highly context dependent, working definitions for what classifies as chronic absenteeism should be determined on a case-by-case basis.
cohort	A group of pupils who are in the same grade and attend a school implementing the EdoBEST programme. (ex. All JSS 2 students attending all EdoBEST schools in the 2023-24 school year.)
comparison group	A group of schools which do not receive the EdoBEST JSS. These schools act as a point of comparison to schools which do receive the programme (labelled as the treatment group), so that the impact of the programme can be assessed.
correct words per minute ‘cwpm’	A metric used to measure oral reading fluency by the number of words read correctly, out loud, from a given passage.

curriculum	A planned sequence of lessons, designed to foster pupils' proficiency in content and/or skills. A curriculum typically includes instructional content, activities, and processes for assessing learners' achievements (UNESCO, 2024). A curriculum may be developed at the national, state, or institutional level, with considerable overlap often occurring among these tiers; typically, broader curricula at the national or state level significantly influence the development of more localised educational programmes.
differentiation	The modification of instruction and curricula to better suit the learning levels and educational needs of pupils.
early childhood education	Schooling, typically for children who are younger than primary school-age, which focuses on supporting cognitive, physical, social, and emotional development through learning activities; it involves instruction outside the family context to develop skills essential for academic readiness and primary education (UNESCO, 2011).
empirical (research/data)	Derived from observed evidence, rather than theory or anecdotal evidence.
enrolment	An individual's registration for an educational programme, public, private, or otherwise. The phrase "rate of enrolment" therefore refers to the proportion of a given population that is enrolled in an educational institution (UNESCO, 2011).
foundational learning	Basic literacy, numeracy, and transferable skills such as social-emotional skills which are required for more complex learning to take place (UNICEF, 2022).
foundational literacy	Key fundamental skills that are prerequisites for the ability to comprehend written text, including but not limited to: phonemic awareness, print orientation, oral fluency, etc.
foundational numeracy	The ability to perform arithmetic operations and apply them to day-to-day life, including but not limited to: number recognition, addition, subtraction, multiplication, and division, as well as word problems involving these operations (World Bank, 2024; UNESCO, 2024).
heterogeneity	The state of being diverse in content, characterised by the presence of distinct and varied components. In the context of this report, the term heterogeneity or heterogenous is used to describe the extent to which dissimilar outcomes exist within a system. For example, if there is "a great deal of heterogeneity in Primary 3 fluency rates in state" that means that fluency rates vary widely among Primary 3 pupils within the state. If there is high "heterogeneity by gender", this means that outcomes for boys are very different from outcomes for girls. Determined relative to that of comparable data sets through standard deviations (National Center of Education Statistics, 2024).

high-income country	This report uses the World Bank's classification of high-income countries: [Countries] with a gross national income per capita, calculated using the World Bank Atlas method, of $13,846 or more in 2022 (World Bank, 2024).
literacy	Leading organisations in international education reform offer disparate definitions of literacy: **External Definitions of Literacy** World Bank/ UNICEF: "[The ability to] both read and write with understanding a short simple statement about [an individual's] everyday life" (UNICEF, 2022). UNESCO/ PIAAC/ OECD: Literacy is the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts (UNESCO, 2024). IALS & ALL: Literacy is using printed and written information to function in society to achieve one's goals and to develop one's knowledge and potential (National Center for Education Statistics, 2003). Demonstrated by the wide variety of definitions above, literacy is incredibly complex and difficult to define. The goal of the EdoBEST JSS programme is for students to be able to read and comprehend a grade-level passage, as determined by the Edo SUBEB. Unless otherwise noted, the EdoBEST JSS programme aligns literacy expectations with the Hasbrouck-Tindal norms.
lesson completion	Lessons are marked as completed if an educator teaches 80% or more of a scheduled lesson's content within 80-120% of the allotted time. The **rate** of lesson completion is therefore the proportion of lessons a teacher, school, district, etc completes out of all scheduled lessons in a given timeframe.
levelling	Setting of the difficulty of curricula and lesson content based on pupils' learning levels and previous levelling decisions.
low- and middle-income country/ countries 'LMIC'	This report uses the World Bank's classifications of low- and middle-income countries (World Bank, 2024): **Low-Income:** Countries with a gross national income per capita, calculated using the World Bank Atlas method, of $1,135 or less in 2022 **Middle-Income:** Countries with a gross national income per capita, calculated using the World Bank Atlas method, of $1,135 to $13,846 in 2022

Junior Secondary School	A level of education that requires the completion of Primary education, and lays the foundation for lifelong learning and human development upon which education systems may then expand further educational opportunities. Programmes at this level are usually organised around a more subject-oriented curriculum, introducing theoretical concepts across a broad range of subjects (UNESCO, 2011).
median	The middle data point in a sequentially ordered data set, or the average of the two middle data points in the set. (Ex. If the data set [2, 4, 7, 1, 2] is ordered sequentially, it becomes [1, 2, **2**, 4, 7] the middle value being 2. The median of this data set is therefore 2.)
non-qualified teachers	Teachers who have not received formal training or education to meet regional standards (UNESCO, 2024).
non-reader	A pupil who, when presented with a passage, is unable to correctly read a single word aloud within a minute.
numeracy	Major organisations offer varying definitions of numeracy: **External Definitions of Numeracy** World Bank: The ability to make simple arithmetic calculations (World Bank, 2024). UNESCO: The capacity of a person to engage in all those activities in which numeracy is required for effective function of his or her group and community (UNESCO, 2024). Because this report refers to both numeracy and mathematics, it is important to note that researchers often distinguish numeracy from mathematics by associating numeracy with skills involving numbers which are commonly utilised in day-to-day life (as opposed to higher level mathematics such as calculus) to a greater extent than mathematics (Dion, 2014; Ginsburg et al., 2006; HRSDC & Statistics Canada, 2005; Karaali et al., 2016). This report uses the terms numeracy and mathematics synonymously. Given existing international definitions, the goal of the EdoBEST JSS programme is for pupils to be proficient in grade-level mathematics skills, as determined by SUBEB.
oral reading fluency	The rate at which a pupil can read a written text aloud (measured in the number of correct words read aloud from a passage within a minute, or 'cwpm').

phase	A portion of a programme's duration, usually as part of an expansion plan as the programme is rolled out to more schools across a territory, when a group of schools implements the EdoBEST JSS programme on the same timeline. For example, if a programme is rolled out through a country in two phases, one group of schools will participate during the first phase, then these schools will continue their participation during the second phase as a second group will begin their participation.
phonemic awareness	The ability to understand that spoken words are made up of individual sounds or phonemes.
phonics	The process of learning to read an alphabetic language by correlating letters or groups of letters with sounds.
Primary education	A level of education that occurs after early childhood education and prior to JSS; it provides learning and educational activities typically designed to provide pupils with fundamental skills in literacy and numeracy, and establish a solid foundation for learning and understanding core areas of knowledge and personal development, with little, if any, specialisation (UNESCO, 2011).
primary-model schools	Schools (regardless of grade level) that use a traditional staffing model of one teacher per classroom with class-level groupings.
progressive-model schools	Schools (regardless of grade level) that have fewer than one teacher per grade-level and use a "multi-grade" teaching model, incorporating ability grouping across grades. For a part of the school day, pupils are grouped by ability rather than by class level, and receive instruction targeted to their ability level.
reading comprehension	The ability to derive meaning from written words when they are part of a text (Hoover & Gough, 1990).
South Asia	A region consisting of the following countries: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, Sri Lanka (World Bank, 2024).
standard deviation	A measure of how widely or narrowly scores are dispersed for a particular data set. Specifically, it is the square root of the average squared deviation of scores about their arithmetic mean (National Center of Education Statistics, 2024).
structured pedagogy	A comprehensive educational approach that enhances classroom instruction through a coordinated package, including detailed lesson plans, along with high quality learning materials and ongoing teacher training. These coordinated inputs create consistency and coherence in educational practices, optimising the teaching and learning experience and facilitating effective instruction (Global Education Evidence Advisory Panel, 2023).

sub-Saharan Africa 'sSA'	A region consisting of the following countries: Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comoros, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Republic of Congo, São Tomé and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, Togo, Uganda, Zambia, Zimbabwe (World Bank, 2024).
Treatment Effect	Changes in the Edo State education system outcomes (such as pupil learning levels) due to the EdoBEST programme (UNESCO, 2024).
Senior Secondary School	A level of education that is typically designed to prepare pupils for tertiary education or provide skills relevant to employment, or both. Programmes at this level offer pupils more varied, specialised and in-depth instruction than programmes at lower secondary education (UNESCO, 2011).
stratification	Sorting data into strata by one characteristic –such as geographic region– usually for the purpose of sampling or randomisation in a randomised controlled trial, such that each stratum is appropriately represented in the sample and/or to increase statistical power.

Abbreviations

EdoBEST	Edo Basic Education Sector Transformation
cwpm	Correct Words per Minute
DIBELS	Dynamic Indicators of Basic Early Literacy Skills
ECD	Early Childhood Development
EGMA	Early Grade Mathematics Assessment
EGRA	Early Grade Reading Assessment
FLN	Foundational Literacy and Numeracy
GDP	Gross Domestic Product
GPD	Global Proficiency Descriptors
GPF	Global Proficiency Framework
HIC	High-Income Country
ICAN	International Common Assessment of Numeracy
LMIC	Low- and Middle-Income Countries
ORF	Oral Reading Fluency
NERDC	Nigerian Education Research and Development Council
RARA	Nigeria Reading and Access Research Activity
sSA	sub-Saharan Africa
SUBEB	State Universal Basic Education Board
UNESCO	United Nations Educational Scientific Cultural Organiza-tion
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development

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I. Preamble

Foreword by Governor Obaseki, Edo State

EdoBEST JSS: Transforming education for a brighter future in Edo State

Education is the cornerstone of development for a productive, fulfilled citizenry. In particular, Junior Secondary is an essential period of education in adolescents' lives. The education they receive in these years sets the tone for the final stages of their academic careers and the start of their adult lives. This is the time when students build upon and refine the skills they need to prosper in their families, communities, and beyond. For these reasons, providing JSS students with an educational experience of the highest quality is of the utmost importance. It is the duty of all teachers, school leaders, and decision makers to ensure students in Edo State receive the learning support they need. I am proud to have spearheaded an administration that has dedicated itself to raising educational standards via transformative policy.

Our commitment to delivering powerful educational opportunities has led to the launch of the Edo Basic Education Sector Transformation (EdoBEST) programme in 2018. I am pleased to report that as of 2022, this programme has expanded to include 281 Junior Secondary schools across the State. This not only means that 97% of the schools in Edo now benefit from the EdoBEST programme, but also that students in upper grade levels are bolstered by a superior learning-focused environment and ample resources. The EdoBEST JSS programme equips teachers and head teachers with motivating professional development, skillfully crafted lessons, and a sophisticated ecosystem so that they may have a positive impact on students year after year.

After two years of operation, these innovations have led to tremendous results. The following report — which tracks outcomes in JSS from the implementation of EdoBEST JSS until the end of the 2022–23 school year — details the exceptional achievements of the programme at each particular stage of its development. I am filled with gratification in seeing that students in these schools have been making large learning gains in foundational English and mathematics after two school years have passed since its implementation. Across JSS, these students are much better positioned to build on their successes and remain on a virtuous cycle for the betterment of their futures.

For the spirit of excellence that surrounds the programme, I would like to commend and thank Mrs. Ozavize E. Salami, the Executive Chairman of the Edo State Universal Basic Education Board (SUBEB), as well as her entire team. They have shown great resolve to usher in the most radical changes Edo State's education system has seen in a generation. My gratitude also goes to NewGlobe, our technical partner, who has availed Edo State of their renowned methods. They have devoted their time and resources to uplifting our schools while demonstrating a tireless faith in our vision. My final thanks go to all the teachers, children, and parents of the EdoBEST schools network for their trust in us. I commend their willingness to work with the government and our technical partner as we implement these practices.

After six years of providing educational services via the EdoBEST initiative, we have celebrated many successes despite a number of challenges. We will continue to identify strengths and areas for improvement through rigorous programme evaluation, in order to ensure that the programme is highly beneficial for years to come. I am confident that all participants in the programme will continue to maintain exemplary learning and realise Edo State's full potential.

His Excellency, Mr Godwin Nogheghase Obaseki,

Executive Governor of Edo State

Acknowledgements

The successful completion of this study is due to the support of many instrumental people. First, we would like to thank the Executive Governor of Edo State, Mr Godwin Obaseki, for his commitment to the transformation of public education and for creating an enabling environment for us to conduct this study. We sincerely appreciate the Executive Chairman of the Edo State Universal Education Board (Edo SUBEB), Mrs Ozavize E. Salami, and her entire team, for the partnership and guidance they provided throughout the planning and execution of this study. We are additionally grateful for the input and guidance of Tim Sullivan, Tobias Mitchell, Savannah Tierney, and Marlee Mullane. We would also like to thank all of the head teachers and teachers who welcomed the study teams into their schools and classrooms.

Finally, we owe our deepest gratitude to the backbone of this project, the field team: Kingsley Akademe, Rosemary Umoize, Aiyemoba Godson Godwin, Mercy Onozome Ajayi, Benedicta Shirley Oziofu Jimoh, Nasamu Victor, Samson Otokurin, Mabel Obamila, Ozaveshe Kolawole Bello, Faith Omo Okojie, Precious Odegua Iyase, Ogechi Obaseki, Faith Omogbai, Aimuanmwosa Oghogho Christabel, Idah-Omorodion Itohan Mercy, Evbuomwan Patrick, Audu Nelson, Solomon Iyare Irehvbude, Omosimua Clementina Ekpe, Allude Endurance, Blessing Agbonhese, Blessing Uwayemen Enaholo, Godwin Ehioze Aimuan, Bruno Afekhena Abu, Aimuan Jemima Osetohanmen, Cornelius Erohubie, Famous Okohue, Obeimhen Osoba, Justice Akpesiri Erhiawarien, Clementina Aigbogun, Ibhabe Joy, Violet Elomese Iyoha, Japhet Irobosa Ehikhor, Gloria Emiebenomon Okojie, Endurance Aro, Beauty Agbonmhere Odugun, Maxwell Esoehe Vekeyata, Akinyemi Philip Yaboame, Victoria Atsekeigbe Imonigie, Sede Abraham Egwahede, Clement Tawab Damodu, Christiana Onosholema Eshemokhai, Bose Racheal Oladipupo, Idia Ohkiyaimeh, Friday Ohkiyaimeh, Ranmi Israel Agbetuyi, Victor John Okologo, Ochuwa Barbara Agbaiza, Olaiya-Samuel Osayi, Timothy Glory Imonkhai, Collins Edugie, Ogboko Anthony Omoimie Edugie, Anthonia Omonlodion, Itohan Iselobhor Iyayi, Oluwakemi Esther Adeyemi, Endurance Afeiyodion, Clementina Iriogbe, Victoria Ladi Osawe, Eki Uwaifo, Mac-clifford O. Obamwonyi, Ogedegbe Omoze Agatha, Omenlimhen Joyheart, Osarewinda Joy, Priscillia Aigbogun, Hope Emihian, Adesuwa Peace Imafidon, Maureen Ekiuwa Igbinoba, Grace Iyore Omokwagbe, Ruth Omonemi Chama, Eve Unuigbe, Blessing Aimuenmwosa Osakpolor, Osahon Lucky Uhunoma, Enogheghase Uyioghosa, Cynthia Efe Ehiorobo, Osezua Ozinegbe, Kingsley Mogbolu, Loveth Omogiate, Ruth Onosholema Asuquo, Christiana Okpataku, Osemwonyenmwen Aghahowa, Elizabeth Irabor, Deborah Nnedu, Deborah Oghogho Osazuwa, Johnbosco Uzogu, Oghogho Joy Emokpae, Omonigho Ochigbo, Emmanuel Ugbiagbe, Desmond Uyi, Prescillia O. Osahon, Rosemary Akhigbe, Elliot Uhunoma, Tunde John Omojowo, Kelly Osagiator Osahon, Chioma Harriet Bazuaye, Ifunnaya Onyinye Ohwovoriole, Dayo Foresythe, Ibhafidon Victoria, Martin Ikuobase, Shadrach Ogiriga Lawani, Abigail Stanley Ashuman, Ebenezer Udukhagene Akharamhe, Omolara Yetunde Oni, Cecilia Edogun, Henry Eruanga, Amenaghawon Ikonmwosa, Jethro Omoragbon, Safuratu Sadiq Abubakar, Gloria Ikhazuagbe, Jesuelo Ohwoka, Patrick Atiborokor, Osose Hebrews Ebosetale, Sandra Emiulimhe Eghele, Ehifo Moses Ezomon, Jacob Umosekhaime, Mary Iwegim, Emmanuella Oladipo, Maimunat Ibrahim, Confidence Ojale, Hauwa Momohsanni, Deborah Ikpemosimhe Anamhomhe, Momoh Priscillia Odomiovaze, Uhunoma Lucky Ewere, Osasumwen Excel Omoregbe, Osarimwian Patrick Osamuyi, and Osarobo Micheal.

II. The EdoBEST JSS Programme

Overview of the Programme

The Edo State Government has put forth a bold vision to transform the quality of public education in order to ensure that all students reach their full potential. The launch of the Edo Basic Education Sector Transformation (EdoBEST) programme in 2018 allocated significant investments towards high-quality instruction and system management, which has led to dramatic learning gains for Primary pupils. This prompted the expansion of the EdoBEST programme to JSS in February 2022. EdoBEST JSS is a holistic, 360-degree programme designed to strengthen all aspects of the Edo JSS system. Through EdoBEST, school leaders and teachers are empowered to deliver transformative education to each child. The programme is dedicated to accelerating learning in all subjects by supporting students in both foundational and grade-appropriate skills.

EdoBEST is anchored in five core pillars:

1. Scientifically based learning materials aligned to the Nigerian 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 Edo State Government in the improved utilisation of existing resources allocated to the public education system
- To build the capacity of school leaders and teachers by training them in the use of effective, scientifically-based instructional practices
- To establish management structures that enable effective governance and ultimately increase the quantity and quality of the instructional time that each student 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 curriculum

EdoBEST JSS: A Holistic Programme with Integrated Features

Academic planning and lesson mapping

EdoBEST drives student 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, EdoBEST offers government and programme leaders visibility into the minute-by-minute experience of students, 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. EdoBEST JSS remain under the purview of the Edo State Universal Basic Education Board (Edo SUBEB). As such, they receive the same level of scrutiny and monitoring as they would outside the programme. The key difference is that public junior secondary schools in the EdoBEST programme receive the additional support provided by the programme.

> *[The teacher guide] is helpful especially as it helps me to manage my time more and deliver more lessons as a teacher.*
> — Category C Teacher

Below are the five core pillars that enable EdoBEST to ensure high-quality learning in each and every classroom:

1. Scientifically-based learning materials aligned with the national curriculum

One key pillar of EdoBEST is the materials that teachers use to ensure that all students master the curriculum and build the necessary foundational reading and mathematics skills to excel in their studies. EdoBEST 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.

EdoBEST enables the teaching of the national curriculum, while also building foundational skills that serve as building blocks for accessing all curricular content. EdoBEST lesson materials cover all curriculum-mandated subjects while including lessons that strengthen the core foundational literacy and numeracy skills necessary for students to meaningfully engage with and master the content in this 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 students' current learning needs. EdoBEST aims to meet students 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 students' learning are administered termly, and the data are automatically captured from these assessments, providing ongoing visibility into students' progress across the entire system. Second, EdoBEST 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.

2. Technology-enabled instructional model

The EdoBEST instructional model is made possible by technology. Teacher guides are shared digitally with teachers through teacher tablets. 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 students. For example, teachers are provided with prompts to pause for student questions or to facilitate small-group sessions, and they can track which students 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. From the delivery of lesson content to supporting strong pedagogical practices to enabling time management, technology enables the EdoBEST 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; teachers need professional development, as well as ongoing support from school leaders. Another key component of EdoBEST is data-driven professional development programmes. Induction training sessions are scheduled ahead of the initial implementation of the programme and at each expansion phase. EdoBEST induction training has three core objectives:

- Ensure that every teacher has the **skills and knowledge** to deliver lessons, manage a classroom, assess learning, and motivate students.
- Develop the **mindset** that every student 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 students.
- Strengthen the **communication strategies** needed to engage with the school community and beyond.

A teacher's support does not end with induction training. EdoBEST 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 encompasses training on new processes, skills, and tools in the EdoBEST programme.

EdoBEST also empowers school leaders to provide powerful coaching for their teachers. Schools receive frequent visits from Schools 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 support teachers' professional development in ways 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

EdoBEST 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?). For quality assurance, a team of School Auditors review school operations both in person and remotely on a regular basis to ensure that all schools maintain an environment conducive to learning. Also, 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 in place 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. EdoBEST tracks all core operational and performance drivers that contribute to learning outcomes, such as student 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 EdoBEST's 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 EdoBEST 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 factor (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 LMIC lack these critical characteristics. Data collected from 2,600 schools over 7 countries in sSA show that approximately 14% of grade 4 language teachers could not spell a simple word like “traffic” or 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 teach effectively. The same study found that less than 31% of teachers were able to independently prepare a lesson plan, develop lesson objectives, formulate questions to check pupils’ understanding, or give feedback (Bold et al., 2017). Given the challenges that many teachers face regarding lesson planning, competing time demands, and school understaffing, it is highly probable that educators lack both the time and capacity required to develop comprehensive syllabi.

Structured pedagogy is a package for educational systems that consists of inputs such as lesson plans, learning materials, and ongoing teacher training (World Bank et al., 2023). Structured pedagogy has been classified as a highly cost-effective intervention by an advisory panel made up of international education experts (GEEAP, 2023). This makes pedagogy reform and implementation particularly attractive for countries facing budgetary challenges and inequitable learning outcomes, as it benefits 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 LMIC. For instance, the RARA (Nigeria Reading and Access Research Activity) programme focusing on supporting teachers with lesson plans and effective strategies resulted in substantial gains in language fluency for Primary 2 pupils, equivalent to almost half a year of additional schooling (RTI International, 2015). Similarly, in an RCT conducted by a team 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, ranking in the 99th percentile of effect sizes measured in LMIC education studies (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 its potential impact is dependent on the quality of the inputs.

The efficacy of structured pedagogy relies on well-crafted implementation, comprehensive support, and monitoring. Empirical research indicates that structured pedagogy, when lacking research-supported methodologies and adequately trained educators to implement it, can lead to diminished or negligible effects on learning outcomes. In sSA 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 studies have 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 improve learning outcomes and empower teachers to facilitate meaningful educational experiences for pupils.

III. Methodological Considerations

Evaluating the Impact of the Programme

The methodological details of this study were designed based on the specific context surrounding the programme’s operation. For the purposes of this report, an impact evaluation is defined as a study that assesses the change in outcomes caused by a particular project, programme, or policy (OECD, 2006; IADB). As such, multiple impact evaluation assessments can occur throughout the life cycle of a programme (USAID, 2018). Impact evaluations are used by the EdoBEST team to study crucial aspects of the programme, maintain transparency among stakeholders, and utilise robust research design to analyse the programme’s effect.

During the first 14 weeks of instruction — which took place during Term 3 of the 2021-22 school year — EdoBEST JSS was implemented in 235 Junior Secondary schools out of 306 in the State. This initial phase of the programme reached over 23,000 students and over 1,500 teachers from all districts state-wide, but was limited to JSS 1. During this initial phase of the programme, it was necessary to determine how the students receiving EdoBEST instruction performed compared to students who had not yet received the programme.

Since the start of the 2022-23 school year, JSS 2-3 have been incorporated into the programme. An additional 46 schools were also incorporated, meaning that the programme now reaches 281 schools and 88,630 students throughout Edo State. Throughout the 2022-23 school year, the team continued to monitor schools that had received the programme since initial implementation to determine whether students’ learning gains accelerated with sustained exposure. As of July 2022-23, only JSS 2 students have received 46 weeks of instruction in total because of the programme’s limited rollout. Students in JSS 1 and JSS 3 have received 32 weeks (or one academic year) of EdoBEST instruction.

“Difference-in-differences” followed by a descriptive study

To successfully execute the ‘difference-in-differences’ approach, data were collected from both treatment and comparison schools in March of 2022 and July of the same year. These data were then used to assess the impact of the first 14 weeks of the programme. To understand how these results changed over time and to provide an accurate picture of the programme’s cumulative effect, the study team collected data from the same group of treatment schools at the end of the 2022-23 academic year. These data are compared to the initial set of findings to understand how students’ learning outcomes were impacted by the programme, and to infer how treated students would have performed without EdoBEST instruction. The study team is therefore able to analyse trends signalling the programme’s impact on students’ learning across the full 46-week cycle and identify potential areas of improvement. These results establish a basis on which future studies can be conducted.

Additional Data Collected

Complementing quantitative results with a qualitative study

To complement the quantitative results obtained during this study, the research team also conducted interviews at the start of the 2022-23 school year. These data allow for a better understanding of the mechanisms affecting stakeholder response to the programme. As such, these in-depth interviews touched upon topics of stakeholder satisfaction with the programme, parental and student engagement, and areas for improvement, among others. In total, 32 interviews were carried out with 7 teachers, 6 head teachers, 7 supervisors, 6 parents, and 6 students from different schools across Edo State. These interviews followed a structured approach, using the protocol outlined in Appendix F. The results were subsequently analysed using conventional coding practices for qualitative data.

Data on teacher attendance, student attendance, and lesson completion

The programme's digital system allows the EdoBEST team to track teacher attendance and lesson delivery in real-time through the teacher tablets. Tracking these metrics over time — for example, comparing average network-wide attendance and lesson completion at the beginning of the programme to the same figures observed at the end of the school year — yields insights on trends in programme adoption and teacher behaviours. These metrics are collected using EdoBEST technology, and therefore are not available for comparison schools. As such, they are helpful in revealing trends in the educational environment that are relevant to the programme's operation, but are not measures of the programme's effect.

Sampling Schools and Students

Schools included in the study

To study the impact of the programme during the 2021–22 school year, 85 schools were sampled — 50 schools that joined the EdoBEST programme during the first 14 weeks of instruction ("treatment" schools), and 35 schools that did not ("comparison" schools)[1]. The set of 50 schools assigned to the treatment group was chosen randomly and is representative of schools across the state. This group was not only necessary for the initial study of the programme, but is also needed to continue tracking schools participating in the programme over time. The 35 schools assigned to the comparison group were chosen from a larger set of 71 schools who could not participate in the programme because they were unable to attend the programme's induction training, despite the Edo State Government's intent to deliver the programme to as many schools as possible.

To study the impact of the programme during the 2022–23 school year, the research team monitored and benchmarked outcomes among the original sample of 50 treatment schools. At this time, most Junior Secondary Schools joined the programme as intended, but there were still 25 schools who did not participate in the programme due to inability to attend the induction training. Nevertheless, the fact that the comparison schools from the previous school year joined the programme eliminates the possibility of using a comparison group for this phase of the study.

[1] Ideally, the comparison group would have been composed of 50 schools, but it proved challenging to select 50 schools from the larger pool of potential comparison schools that all had a sufficient number of JSS 1 students. Enumerators discovered that some schools had fewer students than anticipated, with some reporting no students in JSS 1 or in JSS at all. Consequently, only 35 schools were reached and assessed for the comparison group. While the difficulties in assembling this group may have affected its representativeness to some extent, the use of a simple random selection model ensured that the included schools are reflective of the broader educational landscape in the state and especially of EdoBEST JSS schools.

The Geographic Distribution of Schools Included in the Baseline Round of Data Collection

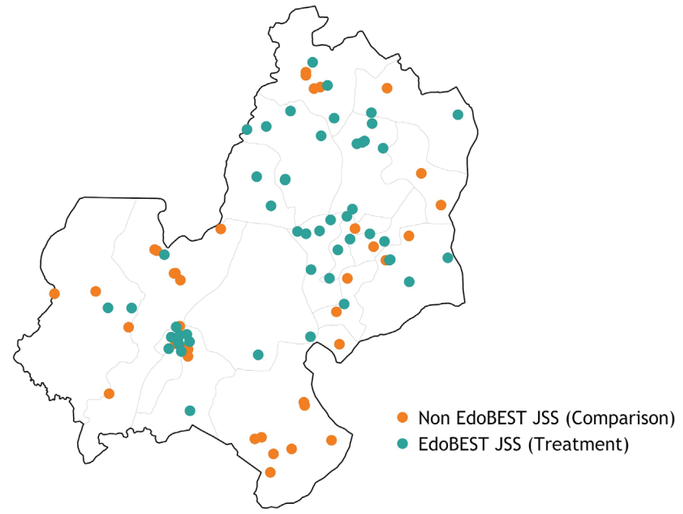


Figure 3.1

Students assessed for this study

Across the 46 weeks of programme implementation, data were collected from students in all three grades (JSS1–3) to form a representative subsample.[2] These students were assessed during three separate data collection rounds. During the first round of data collection in March 2022, 2,692 students were assessed at the start of the programme. This was approximately 32 students per school, composed of an average of 15 students from JSS 1, 8 students from JSS 2, and 8 students from JSS 3. During the second round of data collection, which occurred at the end of the 2021-22 school year, 2,009 students were assessed to measure learning outcomes after the initial 14 instructional weeks. Finally, at the end of the following (2022-23) school year, after 46 total weeks of programme implementation, 1,369 students in the original set of 50 treatment schools were assessed. As the sampling approach for this study consists of "repeated cross sections" of students within the same schools, it tracked the same schools over time but not necessarily the same group of students within these schools. Instead, a new sample is randomly selected for each round of data collection. Therefore, while each sample of students is broadly representative of their respective school and grade, the data shown in this report are not meant to represent individual students' progress over time, but rather the programme's systemic impact on Edo JSS education.

[2] Although only JSS 1 students received the programme during the first 14 instructional weeks, assessment data were collected for all three grades throughout this study because it allows for essential insight into the typical grade-on-grade growth trajectory of Edo State JSS students before and after the programme expanded to include JSS2-3.

Learning Assessments Used

This report documents relevant information on the status of learning outcomes in Edo State before and after the implementation of the EdoBEST JSS programme. For the programme to be effective — and any educational intervention targeting foundational learning, for that matter — understanding students' English and mathematics proficiency levels is crucial, as these data inform the creation of levelled instructional materials. In order to identify learning gains in English literacy and mathematics, the study assessed the following foundational subskills:

English literacy

Literacy is a lifelong skill that consists of multiple cumulative subskills, all of which are imperative for children to learn in order to become proficient readers. Reading fluency and reading comprehension are two key subskills that support overall literacy, and this study determines student competencies in both of them via validated assessments.

Reading fluency

Reading fluency is the ability to read quickly, accurately, and with expression. Previous research has shown that this is one of the components of early reading that is most correlated with other key subskills on the path towards reading proficiency. In other words, if a student does well on this construct, it is a strong signal that they have also mastered more basic skills (e.g. letter recognition), and are capable of acquiring more advanced tasks, like reading comprehension. To quantify this skill, the metric used by this study is “correct words per minute” (cwpm).

This study relies on two passages to measure reading fluency. The first passage is a JSS1-level text drawn from DIBELS, a reliable and valid assessment of early reading development widely used in evaluation studies of educational interventions (University of Oregon, 2018; Vernon-Feagans et al., 2018; Cheung, A. C. K & Guo X., 2018; Kim et al., 2011). The purpose of this text is to allow for comparison across grade levels of reading proficiency. The second passage is a grade-level passage selected from NERDC-approved English textbooks. Using grade-level passages allows for assessment of the degree to which students can engage with the NERDC curriculum.

Reading comprehension

In addition to reading fluency, students were also assessed on their reading comprehension. Students must be able to comprehend what they read in order to reap the benefits of literacy. As such, this assessment was incorporated into the study in order to monitor whether students understand what they read. After students complete the fluency assessment, they were asked to answer two reading comprehension questions related to the text: one being a direct question for which the answer could be found directly in the text and the other being an inferential question where the answer must be deduced from the text.

Maths

Students’ maths skills were assessed using the International Common Assessment of Numeracy (ICAN). ICAN is an internationally validated tool that measures learning across five core mathematics competencies: number recognition, addition, subtraction, multiplication, and division. The version of ICAN used in this study also includes two additional tasks regarding fractions and equations to cover more grade-appropriate topics, and four word problems which assess students’ ability to translate their knowledge of arithmetic operations to real-world situations. As such, the EdoBEST team refers to this expanded version of the ICAN tool as ICAN+. Because the ICAN+ assessment is not administered as widely internationally as the standard ICAN assessment, international comparisons can only be made regarding some maths results from this study.

Box 2. The Value of Foundational Skills Among Older Children

Given the cumulative nature of learning, mastery of foundational skills in the early stages of learning is critical for continued success in secondary school and beyond. Yet, by adolescence, millions of learners across the world have still not mastered foundational literacy and numeracy skills, even when progressing through school (UNICEF, 2022; World Bank, 2018; Belafi et al., 2020). The Programme for International Student Assessment (PISA, 2015) showed that 15-year-old students in the majority of participating LMIC were below the 25th percentile on the performance distribution (World Bank, 2018). A 2021 UNICEF study conducted across 12 LMIC showed that only an average of 42% of students up to the age of 14 possessed foundational literacy skills, with only 28% possessing foundational numeracy skills (2022).

Foundational skills are necessary to effectively advance learning, comprehension, and problem-solving skills throughout students’ education and careers. Lacking foundational skills in later grades is especially challenging, as students who did not master the foundations in Primary school will have a harder time participating in more advanced lessons and engaging with more complex learning materials. This can have a negative impact on further skill development, career opportunities, and social mobility later in adulthood (Belafi et al., 2020). For instance, a World Bank study conducted in 2022 in Thailand found that 63% of youth and adults between 15 and 40 years old did not meet minimum reading standards, which included basic tasks like “reading continuous text with a degree of fluency” or “comparing and contrasting information”. Their low performance on this assessment translated to lower employment rates and lower income than their higher-performing peers (World Bank, 2024).

Although these individuals are beyond the typical age range of “early learners”, dedicated instruction towards mastery of foundational skills is nonetheless essential for enabling them to engage with grade-appropriate academic content, and for preparing them to be successful in more advanced levels of education. The World Bank study concluded that improvements to educational quality could reduce the proportion of low performers, and that interventions to raise learning levels by age 15 would make adolescents more likely to participate in opportunities for furthering their education (World Bank, 2024). In schools, prioritising mastery of foundational skills requires diagnosing learning deficits between grade-level expectations and student ability, making interventions manageable for teachers and school support staff, implementing remediation efforts that target children at their current learning levels, and tracking evidence on what works (Belafi et al., 2020; World Bank, 2024; Banerji and Murthi, 2023).

Insufficient mastery of foundational skills inhibits all subsequent learning, thus diminishing the potential for higher productivity in the labour market (World Bank, 2024; Belafi et al., 2020). To make education systems more effective, governments and schools can introduce mechanisms for teaching and reinforcing foundational skills with the goal of increasing 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.

IV. The State of Learning in Edo JSS Before the Programme

Before the Programme, Edo JSS Students Struggled to Read Despite the Widespread Success of EdoBEST Primary

Despite the success of the EdoBEST Primary programme, learning outcomes in Edo JSS schools remained concerningly low. In March of 2022, 1-in-5 JSS 1 students could only read 10 cwpm or less. In other words, it took 20% of JSS 1 students at least six seconds to read a single English word. Researchers estimate that the bare minimum reading fluency rate needed for reading comprehension is 45 cwpm (Abdazi, 2011). 50% of JSS 1 students did not meet this threshold, meaning they could not read fast enough to understand the text. These poor fluency rates were not exclusive to JSS 1. Before the programme was implemented, the average JSS 2 student in Edo State could only read 76 cwpm from a JSS1-level passage. On the same passage, the average JSS 3 student only read 81 cwpm. For context, students in high-income, English-speaking countries read 100 cwpm by the end of Primary 2 on average. Therefore, regardless of grade level, most JSS students in Edo were dramatically underperforming in English reading fluency.

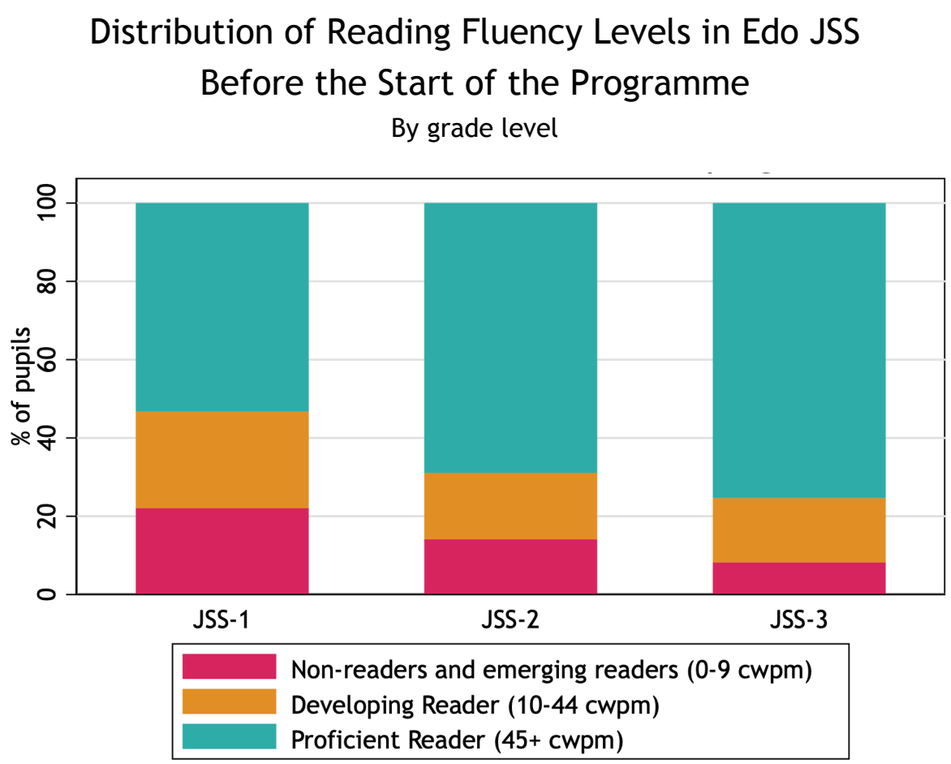


Figure 4.1

The fact that reading fluency rates in JSS 1 prior to the programme were found to be so low, despite the success of the EdoBEST Primary programme, requires deeper investigation. Had there been no compositional changes in the student body from Primary 6 to JSS 1, one would expect the two groups to have similar score distributions or for the JSS sample to be slightly higher performing. However, as demonstrated by the figure below, the distribution of reading fluency scores in JSS 1 was significantly more skewed towards weak performance than EdoBEST Primary 6 fluency rates from the previous year, with a large peak in the 0-30 cwpm range. Consistent with this, in Term 3 of 2021, only 4% of Primary 6 pupils in EdoBEST Primary schools were classified as non-readers, whereas in term 2 of the following year, a much larger share – 16% – of Edo JSS 1 pupils were classified as non-readers. While some differences in reading fluency proficiency were expected, the magnitude of this disparity – along with the markedly different distribution curves – suggests a compositional change in the cohort enrolled in Edo JSS during the first 14 weeks of instruction. In other words, it is possible that the increased rate of non-readers from Primary 6 to JSS 1 can be attributed to an influx of students who did not attend EdoBEST Primary.

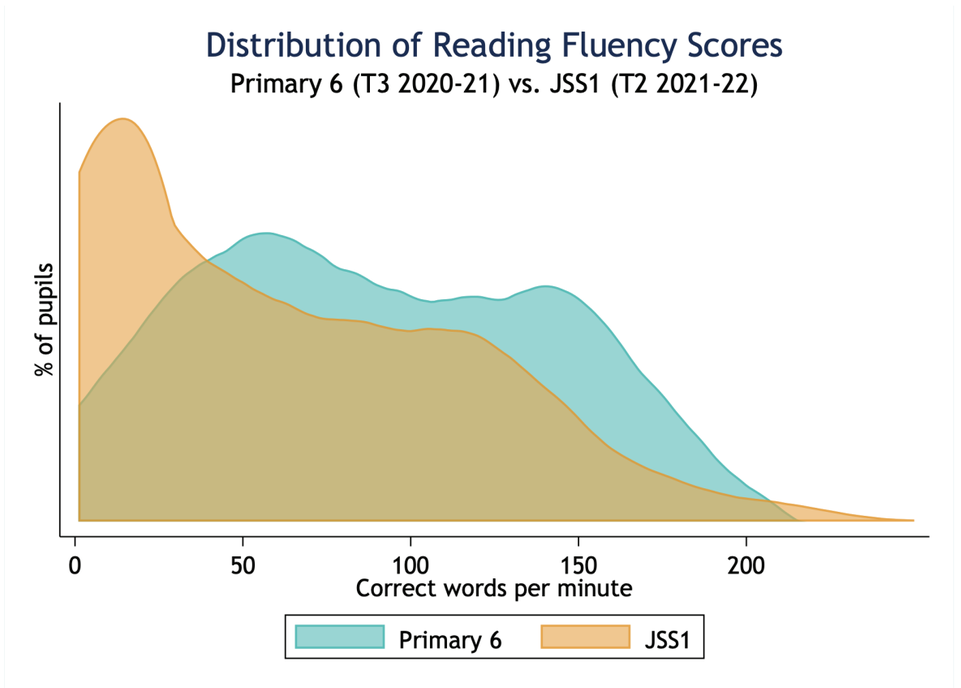


Figure 4.2

In JSS 3, reading fluency levels were higher, notably reaching nearly 100 cwpm when assessed with the grade-level passage. However, this figure must be interpreted with caution. Chronic absenteeism and high dropout rates are prevalent in Edo State, particularly in SSS (NPC, 2009). Because high performing students are more likely to stay in school, the JSS 3 sample in this study is likely disproportionately higher performing than the group of students assessed for JSS 1. Therefore, the differences in learning outcomes within this report between JSS 1 and JSS 3 may be overstated. Taken together, these data demonstrate that JSS students in Edo State were in great need of a revised curriculum with a focus on foundational literacy before the programme.

JSS Students Struggled to Solve Basic Maths Problems

A similar trend to that seen in reading fluency was observed for basic mathematics skills measured at the start of the EdoBEST JSS programme. Concerningly, 10% of JSS 1 students could not solve a simple addition problem (32 + 15) despite having spent nearly seven years in the education system. A similar number of JSS 1 students were unable to solve a simple subtraction problem (46 – 21). According to the NERDC, pupils should master these operations by the end of Primary 2. Therefore, according to national standards, 10% of JSS 1 students in Edo State's public schools are five years behind where they should be in terms of basic maths skills.

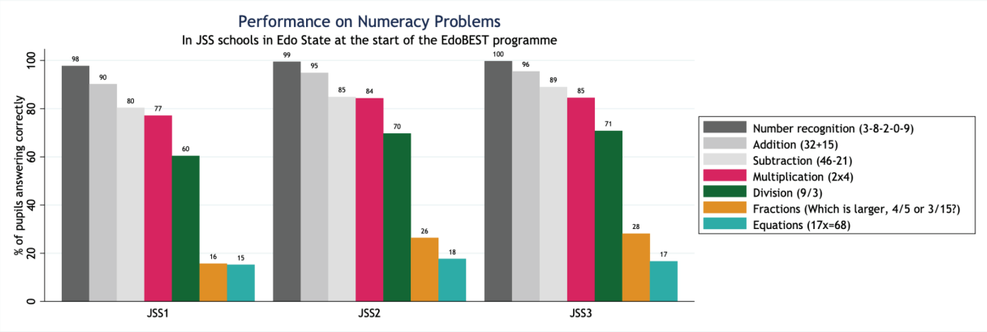
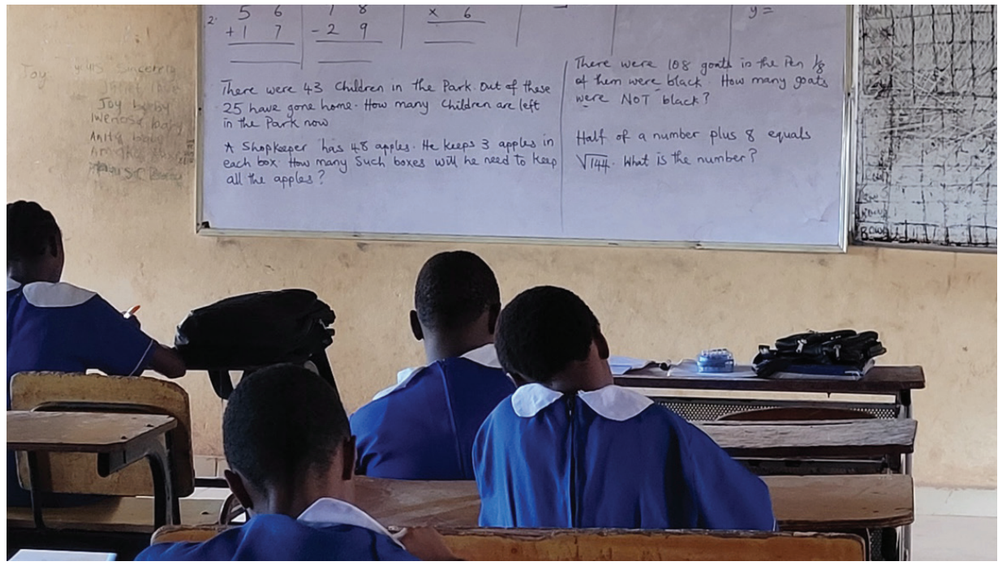


Figure 4.3

Furthermore, few students were able to solve slightly more complex problems. Before the programme, half of all JSS 3 students could not solve a subtraction problem with borrowing such as '78-29'. The average JSS student could not correctly answer questions such as 'Which is larger, 4/5 or 3/15', or equations such as '17x = 68'. According to NERDC curricula, students are expected to "apply trigonometric ratios in solving world problems" by JSS 3. Yet, only 20% of students could solve problems involving "simple" fractions and algebraic equations. Therefore, JSS students on average lacked the basic skills required for them to engage with grade-level maths problems, limiting their ability to realise their academic potential.



V. Results From the First 14 Weeks of the EdoBEST JSS Programme

No Accelerated Growth in Learning Outcomes Was Observed After the First 14 Weeks of Instruction

After 14 weeks of EdoBEST instruction, students in EdoBEST JSS grew at the same pace as students in comparison schools. In other words, these first 14 weeks of the programme did not begin to translate into higher learning outcomes compared to those prior to the programme. This was the case for both English reading fluency outcomes and mathematics outcomes (Figures 5.1 and 5.2), and was true for the most fundamental subskills as well as more advanced skills. EdoBEST JSS schools did not see a greater reduction in the number of non-readers than comparison schools, and there were no accelerated gains for more grade-appropriate subskills such as reading comprehension or advanced mathematics subskills.

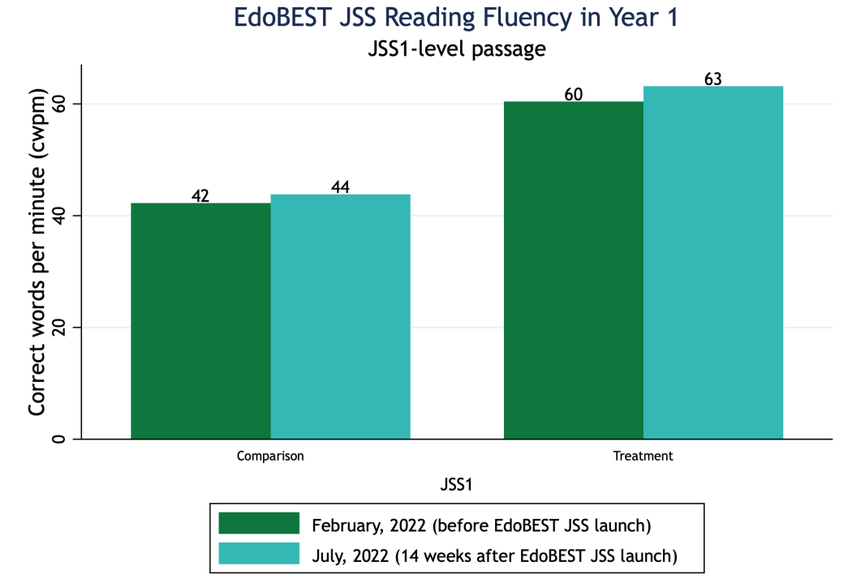


Figure 5.1

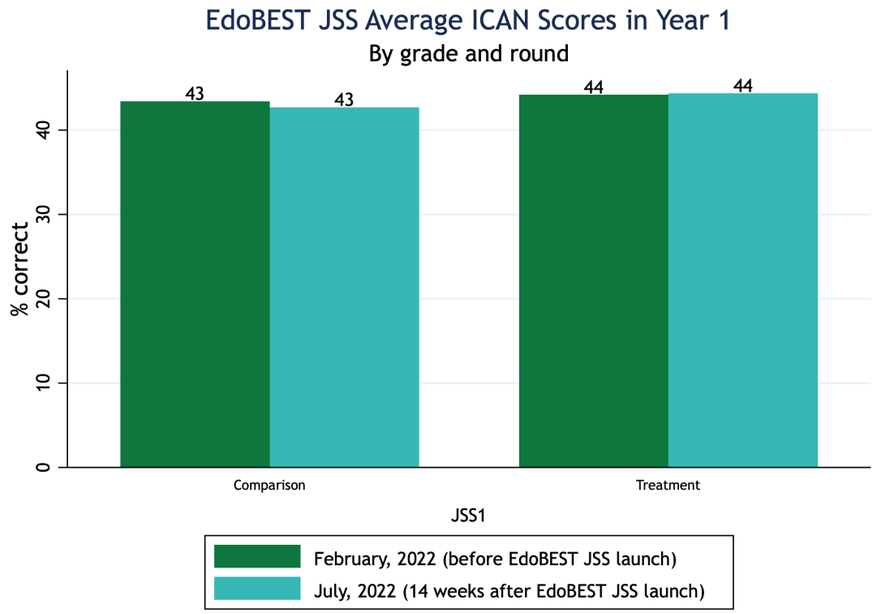


Figure 5.2

Many Factors Contributed to the Lack of Accelerated Learning Gains During the First 14 Weeks

Overcrowding in classrooms hindered learning gains

The average student-teacher ratio (STR) in an EdoBEST JSS 1 class, at the end of the 2021-22 school year, was 41:1. However, this does not properly convey the extent to which there were classes and schools with significantly larger STRs, which may have contributed to weak learning gains during this period. While structured pedagogy techniques and teacher support provided through the EdoBEST programme can enhance classroom instruction, the effective imparting of lessons also requires a certain degree of individualisation (e.g. through checking and responding to each student's in-classroom practice, or providing feedback after call and response). Therefore, even if large-group instruction is improved, larger class sizes detract from the amount of individual support teachers can provide to each student on average.

To further illustrate this, there is suggestive evidence that smaller JSS participating in the EdoBEST programme experienced the largest gains throughout this period. For example, when comparing the gains achieved by the smallest schools — JSS 1 classes of 31 students or fewer, representing the 25th percentile — to those achieved by other EdoBEST JSS, the learning gains among these smaller schools are significantly larger than among their counterparts. The impact of large class sizes on learning also emerged during qualitative interviews, where teachers and students consistently reported that classrooms are overcrowded, which they believe is negatively affecting their teaching and learning:

> *Our classes are overcrowded and most often very noisy.*
> —Student D

> *Most classes are overpopulated and it is difficult to effectively deliver this kind of methodology in a crowded environment.*
> —English Teacher

Unreliable teacher coverage presented a further hindrance to learning

Understaffing and sub-optimal allocation of teachers across schools can contribute to the persistence of weak learning outcomes as well, by reducing instructional time and increasing the STR. At some schools, teacher shortages were the result of unfilled vacancies and a lack of available substitute teachers. At the programme's inception, there were approximately 900 vacant specialist positions in total. At some schools, there were substitute teachers available, but many could not be assigned to fill vacancies, primarily due to a lack of alignment between their specific subject specialisations and the subject-area vacancy. As a result, a sub-optimal distribution of JSS teachers across the State, both in terms of quantity and specialisation, complicated the implementation of the EdoBEST model during its first 14 weeks. This issue has notably improved, however, since the introduction of the EdoSTAR fellows programme, which is syndicated by EdoBEST and has significantly reduced vacancies documented at the start of the programme.

> *[There was a] shortage of teachers, which made most teachers overworked, and no textbooks to make references during teaching.*
> —Head Teacher I

> *Improve staffing to avoid teachers being overstressed.*
> —Head Teacher L

> *[Teachers'] major complaint was the lack of adequate number of teachers to cover all classes and subjects.*
> —Supervisor M

The staggered rollout of the programme limited coherence across the education system

Since the EdoBEST programme is designed to be a comprehensive, whole-system approach, a phased rollout was a sub-optimal strategy for this intervention in its first 14 instructional weeks. Ideally, the programme would have been put into effect for all grades operating within the same physical educational institution, or at the very least, for all grades of a specific level of schooling within the larger education system (e.g. Primary 1-6, JSS 1-3, etc.). At least partly as a result of the fact that it was initially extended to only a single grade in JSS, the programme had sub-optimal impact. This limited-scale expansion of the otherwise-impactful EdoBEST programme created incoherence among students, teachers, head teachers, and support staff.

Students who did not participate in the programme's first phase of implementation saw other classes learning using very different methods; their unfavourable response affected the other stakeholders in the education system. As a result, classroom management and behavioural modification techniques like 'cheers' and 'STRIVE boards' had an effect more similar to a point-based solution than a holistic approach.

Teachers participating in the EdoBEST programme had similar experiences, and for some, these experiences came alongside the added expectation to be more versatile by employing different methods when teaching different grade levels (i.e. undertaking conventional lesson-planning responsibilities for JSS 2 or 3, but using the pre-prepared teacher guides for JSS 1). Scenarios like this created an uncertainty around teachers' responsibilities within schools. Even among those teachers who taught only in JSS 1, the lack of programme implementation in other grades created a visible and unmotivating separation of expectations in the school, which likely limited some of the positive effects of the programme.

For head teachers and support staff, managing a school with both EdoBEST JSS teachers and JSS teachers not yet supported by the programme was a major obstacle to programme implementation. This split affected a wide range of school management practices, including timetable creation (i.e. using EdoBEST digital timetables and specialist rotations for JSS 1, while creating their own versions of these for JSS 2 and 3), observation and coaching (i.e. supporting JSS 1 teachers on how to use the teacher guides, but coaching JSS 2 and 3 teachers on more traditional pedagogical practices), and daily operations (i.e. monitoring EdoBEST teachers who marked their arrival to class digitally, while other teachers checked in using analogue methods or not at all).

These perceptions were also captured through qualitative interviews. For instance:

> ***The teachers in JSS-2 and -3 were demotivating the ones in JSS-1 by coming to school late and acting nonchalant because the tablet was not capturing them.***
> —Head Teacher M

> ***The JSS-2 and -3 students felt left out.***
> —Head Teacher M

Despite these operational challenges during the initial phase of the programme, whole-school implementation was achieved during the following 32 weeks of the programme and much stronger learning outcomes were also observed during this period.

VI. The Annual Impact of the Programme: Results From the 2022-23 Academic Year

English and Maths Skills Dramatically Improved

Students in JSS 1 and 2 achieved significantly higher reading fluency rates and reading comprehension scores[3]

JSS 1 students achieved particularly large gains in reading fluency when assessed with the JSS1-level passage. **In one year of programme implementation, the average reading fluency rate in a typical JSS 1 classroom increased 21 cwpm, from 65 cwpm to 86 cwpm** (Figure 6.1). This level of progress translates into an effect size that places this programme in the 95th percentile of education interventions studied in LMIC.

The fluency rate of the average student in a JSS 2 classroom reading a JSS1-level passage increased by 4 cwpm to 95 cwpm (Figure 6.1); this may not appear large relative to JSS 1s' gain of 21 cwpm, but is notable when considering that JSS 2 students started at a higher level of proficiency. Smaller rates of progress are more meaningful at higher levels of reading fluency, given that the gap between their current level and the level they need to meet curriculum standards is smaller. For instance, if using 150 cwpm — the median reading fluency level of JSS students in high-income, English-speaking contexts[4] — as a benchmark, JSS 2 students in EdoBEST schools have made considerable progress towards achieving a functional level of fluency.

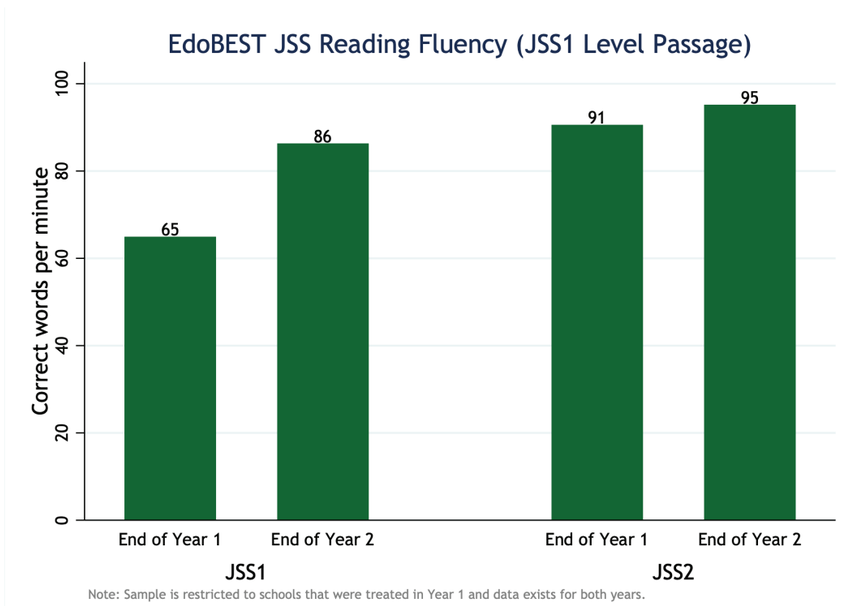


Figure 6.1

[3] JSS 3 results are not represented in the following section. Due to data collection issues, there were not enough data to have a representative data set for JSS 3.
[4] According to Hasbrouck & Tindal Reading Fluency (Spring) Norms (2006).

Research shows that students' reading fluency progress slows once functional fluency levels are reached. As such, the priority for these students shifts towards increasing reading comprehension (LoGerfo et al., 2006; Denton et al., 2007). EdoBEST JSS students have made substantial progress in this area. In one year, **JSS 2 gained an average of 16 percentage points on reading comprehension test scores** when assessed with a grade-level passage (Figure 6.2). Given that reading comprehension is the ultimate goal of literacy, it is promising that JSS 2 students understand more of what they read than they did before the EdoBEST programme. Students in a typical JSS 1 classroom also improved their reading comprehension in a grade-level passage. They have increased their scores by 8 percentage points, or 57% (Figure 6.2).

Overall, the patterns observed among EdoBEST JSS students mirror the patterns that students are expected to follow when developing strong reading proficiency. Specifically, rapid growth in reading fluency (as demonstrated by JSS 1 students) that is eventually supplanted by growth mainly in reading comprehension (as demonstrated by JSS 2 students) indicates successful movement through the stages of learning to read. Ideally, students would complete these stages in Primary grades. Nonetheless, their current progress serves as a positive leading indicator that these students are becoming better equipped to meaningfully engage with their current studies and participate in more advanced levels of schooling.

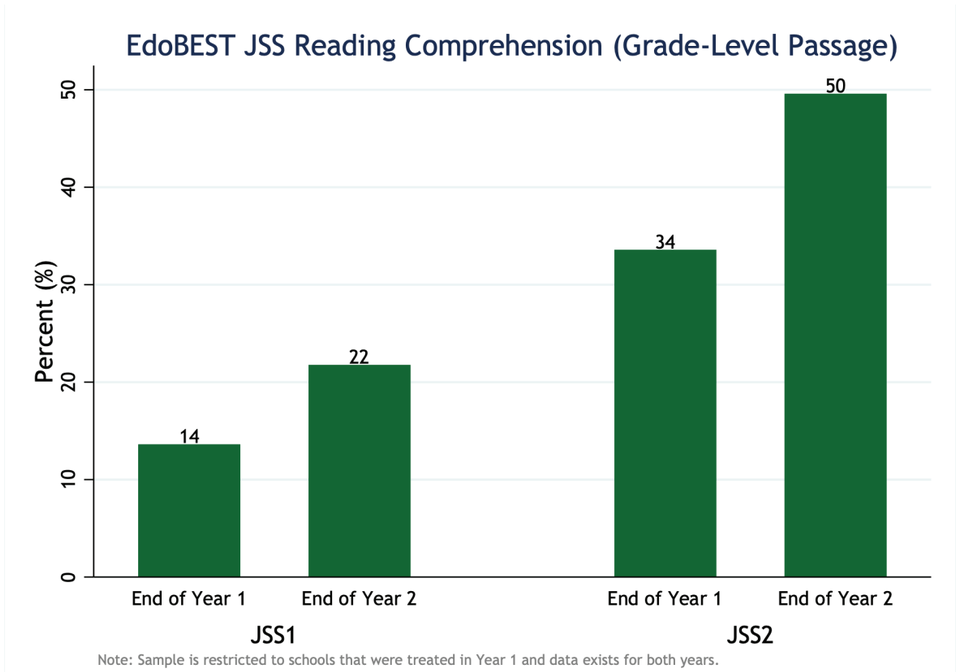


Figure 6.2

The proportion of JSS 1 non-readers decreased by 5 percentage points in one year

The share of students in a typical JSS 1 classroom who could not read a single word decreased by 5 percentage points. As of **Term 3 of the 2022-23 academic year, the proportion of non-readers in a typical JSS 1 classroom is now less than two-thirds of what it was at the end of the previous academic year.** In a typical JSS 2 classroom, roughly 1 in 12 students (8%) are non-readers. It is a promising indicator that more than 90% of JSS 2 students can read in English, although the share of non-readers within this cohort did not decrease during this period.

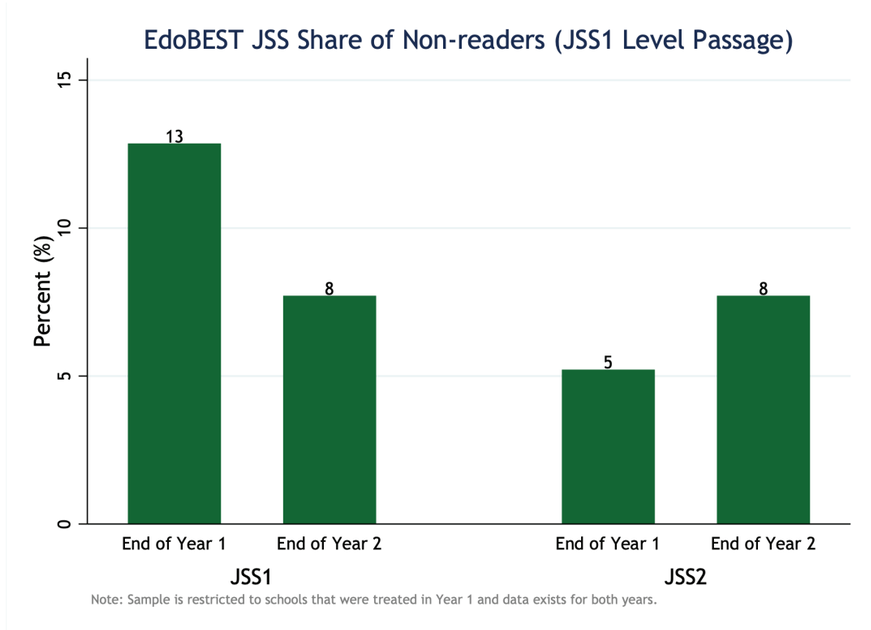


Figure 6.3

Maths scores substantially improved across all grade levels

The average JSS 1 and 2 student gained 10 percentage points on ICAN+ scores on average (Figure 6.4). This result means the programme's effect on mathematical learning outcomes is in the 95th percentile of educational intervention programmes. Moreover, this level of progress is an encouraging indication that students across grades are responding equally well to the improved instruction provided by EdoBEST, allowing high-quality learning to become standardised throughout JSS.

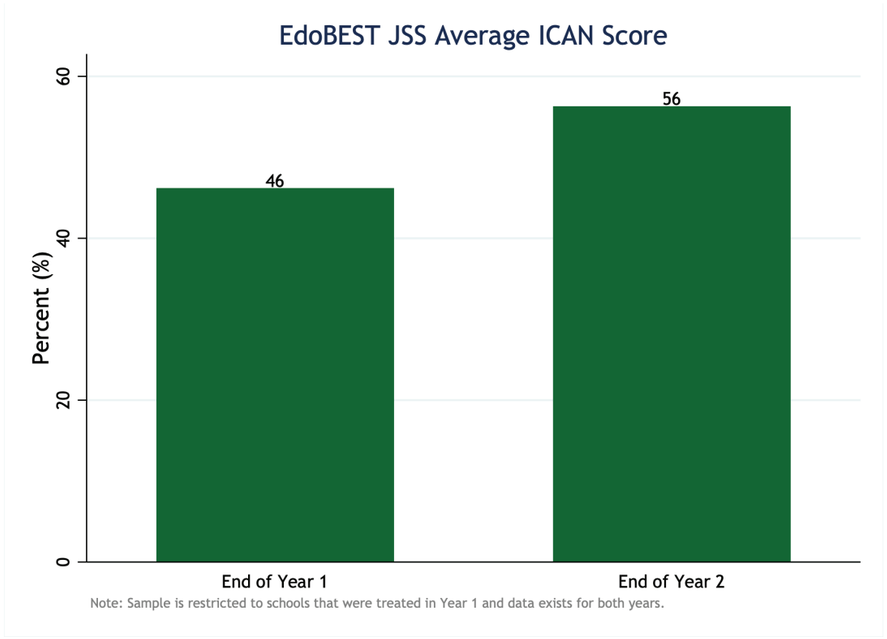


Figure 6.4

The EdoBEST JSS programme has led to improvements in every assessed maths skill

Students in JSS 1 and 2 demonstrated promising levels of proficiency in addition, subtraction, and multiplication after 46 weeks in the EdoBEST programme. For example, students achieved an average score of 92% on the addition problems included in the ICAN+ and an average score of 76% on the multiplication and subtraction problems (see Appendix B).

Both JSS 1 and 2 students also made substantial progress on the most challenging sub-tasks included in the ICAN+: division, fractions, and algebraic equations. **Students increased their scores by 4 to 19 percentage points across all of these sub-tasks**. After 46 weeks of programme implementation, JSS 1 students are performing much better than what JSS 2 students did prior to the start of the programme. Overall, their strong performance on these mathematics operations serves as a positive leading indicator that they are becoming prepared to take on more advanced mathematical operations appropriate for their grade levels.

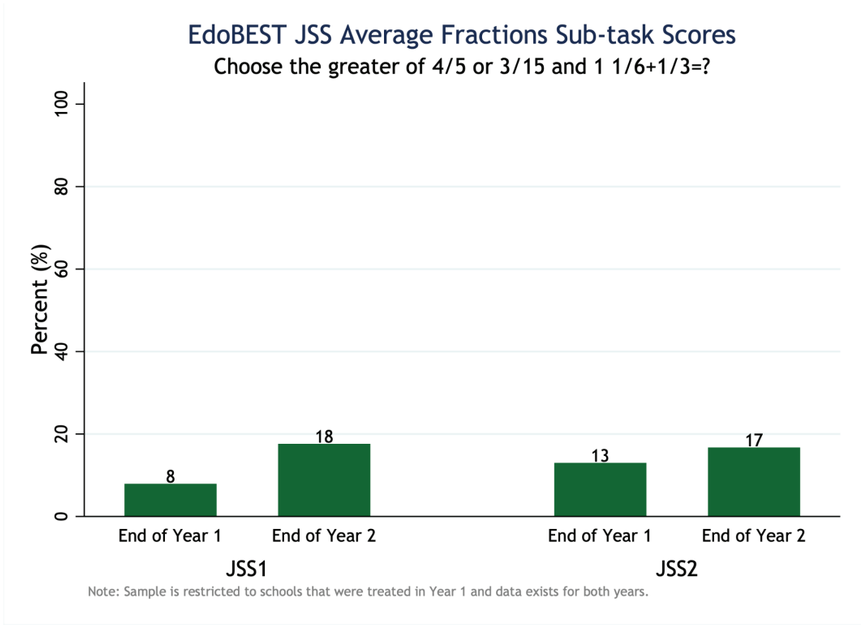


Figure 6.5

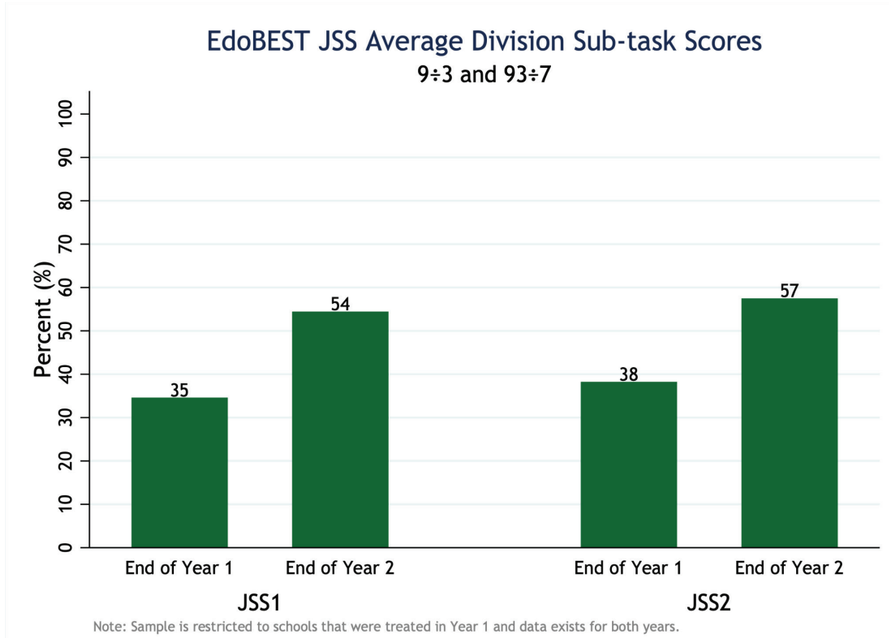


Figure 6.6

Other Improvements to Programme Implementation

Teacher attendance has soared throughout the 46 weeks of the programme

Teacher attendance has doubled from 43% at the beginning of the programme to 86% at the end of 46 weeks (Figure 6.7)**.** This massive improvement in teacher accountability and professionalism is pivotal for ensuring that teachers consistently deliver high-quality lessons to students and further develop their own pedagogical best practices. Having teachers present in schools and classrooms when they are expected to be is an essential part of programme implementation, which, in turn, drives improvements in student learning outcomes.

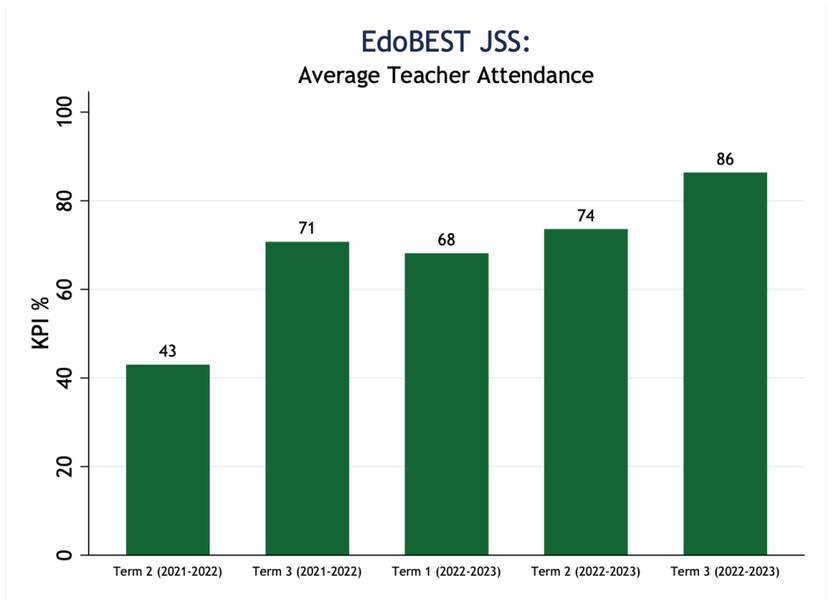


Figure 6.7

This finding is echoed in the qualitative data as well — 5 out of the 7 interviewed Schools Supervisors and all of the interviewed students reported that teachers came to class more often and on time.

> *"[The EdoBEST JSS material] is helpful especially as it helps me to manage my time more and deliver more lessons as a teacher."*
> —Category C Teacher

This increase in teacher attendance is meaningful not only for students' learning outcomes, but also for optimising the utilisation of fiscal resources allocated to teacher salaries. Inversely, teacher absenteeism

To assess the fiscal burden posed by teacher absenteeism, researchers have analysed data from statistically representative teacher samples in numerous contexts to calculate the proportion of time that an average teacher is projected to be absent from the classroom. This figure is then multiplied by the teacher's annual salary and the number of teachers in the region of study, yielding the fraction of public expenditure on teacher salaries for which there is no return on investment due to teachers' absence (Murhalidan et al., 2017). This type of calculation can be helpful within the context of EdoBEST JSS, to better understand — at least directionally — the potential effect of the observed gain in teacher attendance resulting from the programme. More specifically, the stated gain of 43 percentage points in 46 weeks can be meaningfully interpreted by first assuming an average annual teacher salary of roughly NGN 3.6 million per year, which then implies better average utilisation worth approximately NGN 1.9 million per teacher. Given an estimated count of 1,500 teachers participating in the programme during its inaugural year, this translates to a collective improvement in the fiscal utilisation of NGN 2.9 billion or, at an exchange rate of NGN 1,481 per 1 USD, 2 million USD. In this sense, the EdoBEST programme, through its improvements to teacher professionalism and accountability mechanisms, has already begun to enhance the return on educational investments.

Box 3. 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 student learning outcomes and enrolment outreach (World Bank Group, 2017). 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 Group, 2017). 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 Group, 2017). 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 students 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 Group, 2017). Teacher absenteeism not only detracts from total learning time, but also negatively impacts the quality of learning that takes place in school (Vargas & Patricia, 2016). When classes are combined to compensate for inconsistent teacher attendance, students 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 students' poor perceptions of the public education system, which leads to lower rates of enrolment and attendance among students, therefore permanently stunting their positive educational trajectories (World Bank Group, 2017).

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 student 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 student learning outcomes (Vargas & Patricia, 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 student learning outcomes.

Corporal punishment is being replaced by positive behavioural modification strategies according to qualitative data

The EdoBEST programme has leveraged professional development to support JSS teachers in complying with the ban on corporal punishment in schools. Traditionally, corporal punishment had been seen as an effective tactic for teachers to manage their classrooms and ensure that students remain on task. However, both Edo State and the Nigerian government has recognised that this approach can have the opposite effect by demotivating students from participating in class, distracting them from the concepts they need to learn during the day's lesson, and in the long term, leading them to consistently underperform compared to their peers and curricular expectations. For these reasons, Edo State has adopted the federal Child Rights Act of 2003 as a state law[5]. To support this shift away from corporal punishment as a go-to classroom management strategy, the EdoBEST programme has aligned teachers and school leaders towards the alternative disciplinary practices of verbal correction, energetic refocusing, and positive reinforcement.

[5] Bashir, J. (2023). *An Evaluation of the Impact of the Child Rights Act in Regulating the Rights of a Child in Nigeria.* International Association of Women Judges. https://www.iawj.org/content.aspx?page_id=2507&club_id=882224&item_id=4600

> *The teaching is more interesting and the teachers are now more friendly and regular in the class-rooms as they don't flog students anyhow but they try to correct more.*
> —Student P

> *We now use cheers and energizers in the classroom while the teacher is teaching and there is no more flogging in the classes.*
> —Student O(b)

Using these strategies, students who have become disengaged from instruction with lively cheers and regular prompts to strive for lesson content mastery, thus facilitating sustained concentration and a sense of individual responsibility in the learning process. Moreover, teachers set a more affirmative example and encourage a healthier relationship with their students, who are more likely to conduct themselves properly when their behaviour is redirected via appropriate means. Thus, over time, students become increasingly more motivated to regularly attend school, retain their lessons, and enthusiastically participate in class.

The education system has improved according to teachers, students, and parents

It is essential that parents, students, and education personnel jointly recognise the benefits of participating in the EdoBEST JSS programme. This not only drives ongoing programme implementation, but also contributes to consistent student attendance and grade attainment, both of which are inextricably linked to student success and the health of the education system.

In this regard, qualitative data show that EdoBEST has been met with abundant approval from a broad range of pivotal stakeholders in Edo State. Since the programme's expansion to JSS, **teachers, parents, and students have reported that EdoBEST has provided a positive example of the capacities and capabilities of public JSS**. Qualitative data indicate that improvements to teacher performance since the start of the programme have driven greater enthusiasm among students to be present at school and keep up with their lessons. The parents of students have noted this heightened interest and have reported becoming more engaged in active discussions with teachers on their children's progress, demonstrating how the academic aspirations of families in Edo State are supported by quality education.

> *I am generally impressed with the programme and it is a great boost for better quality of education for public schools in Edo State.*
> —English teacher

> *The use of digital methods in teaching and the improved level of school management has been awesome. I must say I see better improvement in my child now more than even when my child was in a private school.*
> — Parent O

VII. Lessons Learned and Recommendations for the Programme's Enhancement

After 46 weeks of programme implementation, the EdoBEST programme has gained momentum in transforming the educational landscape within Edo State, effectively adapting its approach to meet the specific needs of both students and school staff. In turn, the quality of instruction and student learning outcomes continue to improve year-on-year. Between March of 2022 and July of 2023, teacher attendance increased 43 percentage points. Over the course of one year, students made tremendous strides in foundational literacy and numeracy. The proportion of non-readers in a typical JSS 1 classroom was nearly halved, and the average JSS student gained 21 cwpm in a single school year. Students in a typical JSS 2 classroom increased their reading comprehension scores by 16 percentage points. In both grades, students' test scores increased by 19 percentage points across division operations, which indicates that they are better equipped to master grade-appropriate mathematics. These findings, among other improvements, demonstrate the positive impact of the continued educational investments made by the State Government.

Despite the improvements observed by the end of the 2022–23 school year, more work is required in order to sustain these positive trends — and build upon them — in the coming years of the programme. The average JSS student is unable to correctly solve any of the ICAN problems involving fractions or algebraic equations, and there are still non-readers in a typical JSS 2 classroom. Therefore, for the 2023–24 school year and beyond, the EdoBEST programme will continue to work to address deficits in lesson completion, student attendance, and the availability of instructional materials, in order to improve students' learning outcomes.

Visibility Into the Progress of JSS 3 Students Must Be Ensured for Future Studies

The hypothesis after the first 14 weeks of EdoBEST instruction was that extending the programme's rollout to the JSS 2 and JSS 3 grade groups would foster higher learning gains by unifying teachers, school leaders, and students towards a common goal underpinned by standardised expectations and resources. Consistent with this hypothesis, this report reveals that students in JSS 1 and JSS 2 have made outstanding progress in the development of both foundational and complex skills during the subsequent 32 weeks of programme implementation. Given the similar growth observed in JSS 1 and JSS 2, it is reasonable to predict that JSS 3 students also benefited from EdoBEST's transformative approach, in line with these measured grade groups.

However, visibility into the JSS 3 grade group was limited because data collection was inopportunely timed. Specifically, as JSS 3 students were transitioning to senior secondary school, there were too few of them to assess at the end of the academic year after exams had taken place. As a result, any data collected from these students did not constitute a large enough dataset to be representative of the grade as a whole. This presented a particular challenge for the programme, as it was especially important to assess their readiness for entry into higher grades. In the future, the EdoBEST team must ensure that JSS 3 students are assessed before they depart from schools.

Lesson Completion Rates Must Continue to Increase in Order to Accelerate Learning

Lesson completion rates have improved only slightly since the start of the programme. Because there was only a modest increase, the average percentage of lessons completed was still under half (44%) after 46 weeks. This is an area that must be improved in future years, as learning outcomes are likely to improve significantly if teachers are able to cover more content with their classes.

It must be noted that the method used to determine this figure employs a stringent criterion for "lesson completion", stipulating that at least 80% of the content must be covered within a time frame that deviates no more than 10% from the allocated duration. Consequently, the stated lesson completion rate may be a slight underestimation of the total instructional time students actually received, as it does not capture other lessons that might have commenced and even concluded, but fell short of meeting this benchmark for any number of reasons.

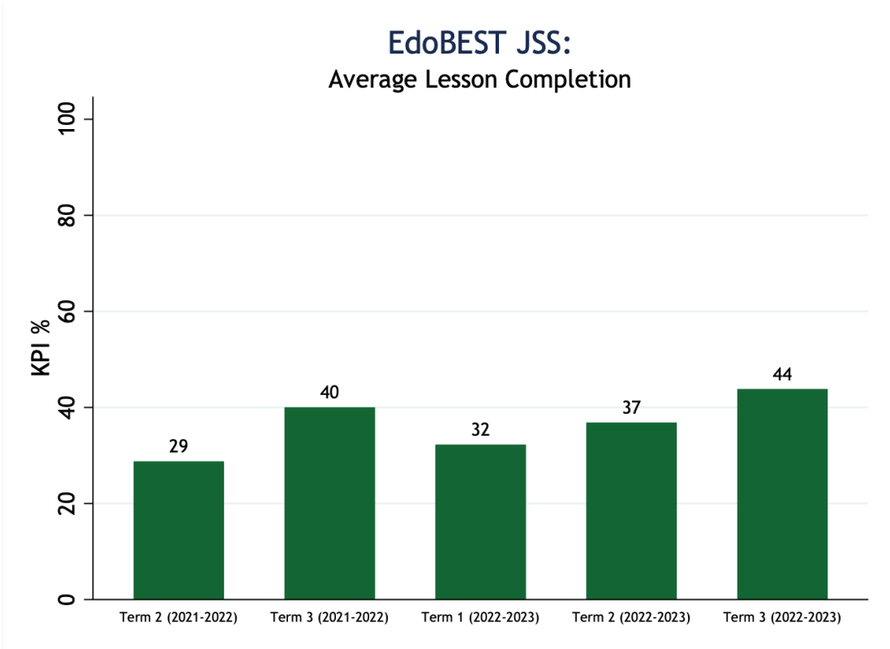


Figure 7.1

Printed Learning Materials Must Be Made Available to Amplify the Efficacy of Structured Pedagogy

Structured pedagogy relies not only on well-designed teacher guides, but also on printed student materials such as textbooks and workbooks, which should ideally be available to students at a ratio of one copy per student. During qualitative data collection, all interviewed teachers confirmed that access to learning materials plays a pivotal role in instructional quality. However, all but one teacher mentioned that there were not enough textbooks and exercise books for all of their students. Both students and parents also reported that the scarcity of these materials restricted students' ability to solidify their understanding of in-class instruction and to study independently.

Without printed materials during all of the 2021–22 school year and much of the 2022–23 school year, the programme relied on "contingency" teacher guides, which were specifically designed for classes that lacked adequate learning materials. While the use of these guides ultimately translated into improved learning outcomes, they were not sufficient, as students are still performing below grade-level on average.

Although learning gains have significantly increased with the following 32 weeks of instruction, students have yet to reach national English and maths expectations. In order to close the gap between current performance levels and grade-level expectations, it is critical to ensure that physical teaching and learning materials are regularly printed and available for use. Otherwise, the programme will be forced to teach English, mathematics, and syllabus-aligned subjects without textbooks or exercise books. Therefore, the EdoBEST programme and its partner stakeholders must ensure that printed materials are available on time and in full.

Make available reference materials and textbooks to support the instructional materials in the tablet. This will improve the pupil's level of understanding.
—Maths and Science Teacher

There are no textbooks or lesson notes to study on our own.
—Student D

Textbooks were not provided to help drive down the lessons properly.
—Supervisor E

The major challenge is that there are no textbooks for my child to study at home…I am concerned on how the students can study on their own after school hours.
—Parent S

JSS Students Must Master Foundational Skills in Order to Engage With Grade-Level Content

JSS pupils do not yet meet national standards for English and maths. Despite large learning gains, many students are still far below grade level. For example, the average JSS 1 student cannot correctly answer one reading comprehension question correctly; even in JSS 2, the average student can only correctly answer two out of four questions. These gaps are particularly consequential for JSS students, given that they have limited time to master relatively complex material before moving on to SSS.

Students in EdoBEST JSS did make large gains in reading fluency, and research confirms that higher reading fluency is necessary to lighten students' cognitive loads enough that they can devote their working memories to drawing meaning from a text (Abdazi, 2011). That said, this **comprises only one pillar of the reading subskills that students must master to achieve reading comprehension**. To ensure that students reach reading levels that enable them to understand the direct and inferential meaning of text, the EdoBEST programme will provide support to address all components contributing to effective literacy development. Specifically, it will deploy supplemental literacy programming tailored to older children who have not yet mastered the expected reading skills. Such programming will teach children proper approaches to building latent reading fluency, while eliminating unhelpful practices they may have acquired, and incrementally work towards comprehension of complex passages.

Despite impressive growth in foundational maths rates among most students, **their scores on grade-level problems remain low in absolute terms**. For example, the average JSS 1 student scored only 18% on ICAN questions involving fractions and slightly lower on questions regarding algebraic equations (Figure 7.2). Both JSS 1 and 2 students earned an average score of less than 50% on division of a two-digit number by a one-digit number with a remnant (Figure 7.3).

Dividing fractions is covered in the first term of the JSS 1 curriculum. Algebraic equations, binary division, and division with negative integers is included in the JSS 1 mid-term assessment and in the Term 2 curriculum. Therefore, during an average day at school, students need to employ advanced mathematical skills that require prerequisite mastery of the corresponding sub-tasks on the ICAN+. In this sense, the fact that students in both JSS 1 and 2 have not demonstrated proficiency indicates that they are not equipped to engage with the grade-level concepts they will encounter in their everyday lessons and termly summative assessments.

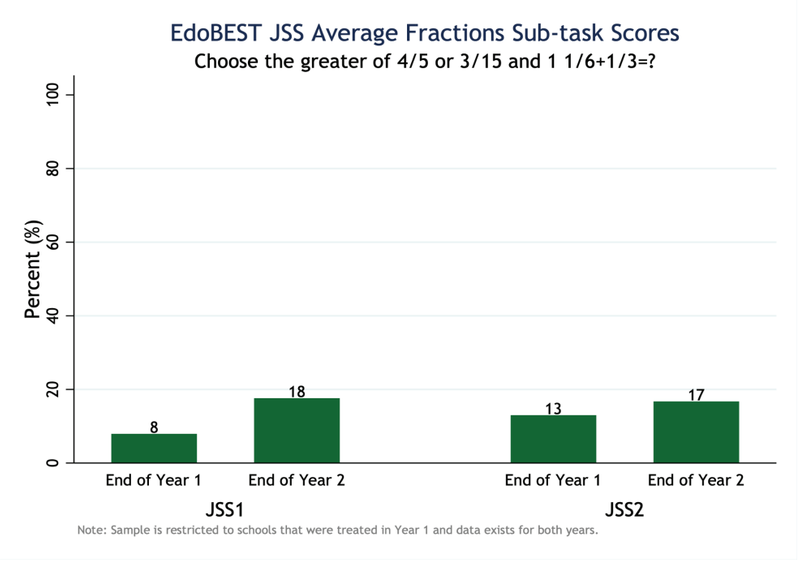


Figure 7.2

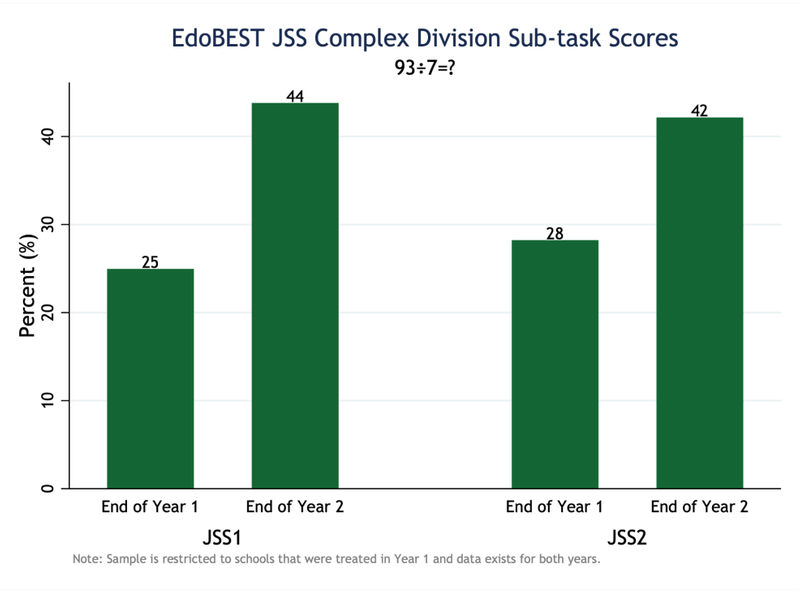


Figure 7.3

In order to ensure that all students are learning at grade level, EdoBEST will continue to maximise the time that each student spends learning in English and Maths each day. This means that each student will receive 10 English Reading lessons, 5 English language lessons, and 10 maths lessons each week. During these lessons, teachers will be supported to deliver high-quality instruction that builds mastery of foundational skills, offers significant opportunities for memory recall to ensure that students retain what they learn, and accelerates learning in order to close learning gaps. By ensuring a high frequency of English and Maths instruction over time, students will receive sufficient learning and practice opportunities to reverse learning deprivation and to achieve true proficiency in foundational skills. This proficiency, in turn, will unlock students' potential to successfully participate in more rigorous grade-level content, especially in upper grades.

Looking Ahead to the 2023–24 School Year and Beyond

The impressive progress of the EdoBEST programme since its expansion to JSS in February 2022 has validated the ongoing investments made by Edo State 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. JSS students have drastically improved their reading fluency, reading comprehension, and grade-appropriate mathematical proficiency. In addition to the main findings reported, supplementary data obtained during the course of this study provide strong signals of even greater educational success to come as the EdoBEST programme matures and incorporates additional schools in need of transformative interventions.

Despite the improvements observed by the end of the 2022–23 school year, more work is required to sustain these positive trends — and build upon them — in the coming years of the programme. As a data-driven programme, EdoBEST will continue to conduct similarly large-scale, rigorous evaluations in subsequent school years. These rounds of data collection will give the Edo State Government further insights into the impact of the programme: what is going well, and what needs to be strengthened. Continued investments to address low lesson completion, overcrowded classrooms, sub-optimal teacher coverage, insufficient learning materials, and low learning outcomes — if done correctly — will drastically improve the quality of teaching and learning across Edo State.

The EdoBEST programme is a bold initiative from the Government of Edo State. During its second year of operations, it has enabled students to be on faster and higher learning trajectories than what they could have expected from non-EdoBEST 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 its EdoBEST programme, Edo State will continue to provide rich, nurturing learning environments across the state, where students of all backgrounds will have the unprecedented opportunity to actually learn in school and thrive academically.

VIII. Appendix

Appendix A: Learning Assessments

Literacy

All students JSS 1-level passage

Changing Bedtime

Tensions are running high in the Groff home as talks on summer bedtime (13)
rules continue. The household is evenly divided into two camps. So far, there is no (28)
sign that either side will surrender. (34)
At eight o'clock this evening, the younger Groffs, Ben and Lu, brought their (47)
demands to their parents. It appears they had been organizing for some time and (61)
were prepared for a fight. They asked for a later bedtime. They said they ought to (77)
be allowed to stay up until ten o'clock in the summer. In support of their request, (93)
they pointed to the facts that they have no school in the morning and that it doesn't (110)
get dark until late in the summer. They also said that everyone else gets to stay up (127)
late and it's not fair. (132)
Their parents responded by offering an eight - thirty bedtime. This would be (144)
a half hour gain for the younger Groffs. The younger Groffs rejected this offer. (158)
They declared it so far below their original request as to be insulting. The mother (173)
of the Groff family gave a speech about the need of growing bodies for proper (188)
sleep. The father made a statement about the parents' need to not have kids (202)
running around all night. The younger Groffs characterized the mother's speech as (214)
dumb. It was typical of their style, they claimed. They disapproved the father's (227)
words, calling them irrational, depicting events that would never happen. (237)
The issue remains unresolved. The younger Groffs' skill at arguing could (248)
keep them out of bed until their desired bedtime. Should this occur, they could (262)
then claim they had been allowed to stay up late before, and so they should be (278)
allowed to stay up late again. If their parents can be convinced that a later bedtime (294)
has not caused a loss in quality behavior, they might back down. However, another (308)
possibility is that their parents are used to stalling tactics and will not be moved by (324)
them. (325)

Total words read _____ Total errors _____ Total words correct _____

Comprehension Questions

1. How did the parents respond to Ben and Lu's proposal for a 10:00 summer bedtime? (A: They proposed an 8:30 bedtime)
2. Why are tensions running high in the Groff home? (A: The parents and the children disagree about the appropriate bedtime during the summer.)

(1)	(2)
___ Correct	___ Correct
___ Incorrect	___ Incorrect
___ Did not reach	___ Did not reach

JSS 1 grade-level passage

Automobiles

An automobile (also called autocar, motor car or car) is a wheeled motor vehicle used for transporting passengers, which also carries its own engine or motor. Automobiles are designed to run primarily on roads, to have seating for one to eight people, typically to have four wheels and to be constructed principally for carrying people rather than goods. (15) (27) (43) (58)

The word automobile comes from the French word automobile from the Ancient Greek word autos (self) and the Latin mobilis (movable): meaning a vehicle that moves. The alternative name car is believed to originate from the Latin word carrus (wheeled vehicle) or the Middle English word carre (cart). (71) (85) (99) (106)

Most automobiles in use today are propelled by an internal combustion engine, fuelled by deflagration of gasoline (petrol) or diesel. Both fuels are known to cause air pollution and are blamed for contributing to climate change. (120) (135) (142)

How does a car work? When a driver turns a key in the ignition, the car battery sends power to the starter motor which turns the crankshaft, which gets the pistons moving, and then the engine fires up and ticks over. A fan draws air into the engine through an air filter. The air filter removes dirt and grit from the air which is drawn into a chamber where fuel (petrol or diesel) is added. (160) (174) (193) (211) (217)

This fuel-air mix (a vapourised gas) is stored in the chamber. When the driver presses the accelerator pedal, the throttle valve is opened. The fuel-air mix passes through an intake manifold and is distributed, through intake valves, into the cylinders. (232) (246) (257)

Total words read _____ **Total errors** _____ **Total words** _____

Comprehension Questions

1. What machine part propels most automobiles? *(Answer: internal combustion engine.)*
2. Why don't we consider a train to be an 'automobile'? *(Answer: Accept responses such as: automobiles were designed to run on roads; have seating for 1-8 people; typically have 4 wheels)*

(1)	(2)
___ Correct	___ Correct
___ Incorrect	___ Incorrect
___ Did not reach	___ Did not reach

JSS 2 grade-level passage

Cooperation

What does cooperation really mean? It means carrying out any piece of work or duty assigned to you willingly, promptly, and efficiently without being forced. When you obey the rules and regulations of a group or society, when you pay your taxes voluntarily, etc. you are said to be cooperating. (17) (32) (40)

Cooperation starts from the home, within the family unit. Each member of the family has to cooperate so as to achieve the goal of the family. If there is a lack of cooperation in the family, the father and the mother will be going in opposite directions while the children will go in another direction. This will have adverse effects on each member of the family. (57) (106) (124) (132)

Let us again look at a football team – whether male or female. Many matches that could have been won have been lost because of lack of cooperation among members. The individual player wants to play to the admiration of the spectators. He wants to 'shine', to take the glory of scoring the goal single-handedly. But a tress does not make a forest. The team therefore ends up being defeated. When, however, each member of the team realised that if the match is won all members will be praised, he is fully determined and committed to the team. He cooperates with other members and eventually the match is won. (150) (166) (185) (201) (219) (234) (240)

In the larger society, there is the need for cooperation to ensure the smooth running of the society. Cooperation comes in form of paying taxes without being coerced, obeying the laws of the society voluntarily and seeking the good and the advancement of the society. When the individual carries out his or her assignment in the society, it will be observed that such a society will enjoy peace, progress and prosperity. If a person lives in a society and fails to cooperate, such a person will be considered as a misfit. (258) (274) (289) (309) (331)

What about the school setting? For the school to achieve its purposed of existence, there must be cooperation. A student who does not cooperate with the school authorities will have himself or herself to blame. The student will end up with a woeful performance in his or her examinations. That reminds me of a popular saying of my former Principal. He used to say that the school authority is a stone while the student is an egg. If the egg rolls to the stone, the egg will break, if the stone rolls to the egg, the egg will break. The egg therefore has to watch it. (348) (363) (381) (401) (424) (437)

Total words read _____ **Total errors** _____ **Total words** _____

Comprehension Questions:

1. According to the passage, where does cooperation start? *(A: With the family)*
2. Is being forced to give money to your community an example of cooperation? Why or why not? *(A: No, because you are being forced. Cooperation must be voluntary.)*

(1)	(2)
___ Correct	___ Correct
___ Incorrect	___ Incorrect
___ Did not reach	___ Did not reach

JSS 3 grade-level passage

Inflation

Inflation is the rise in general level of prices of goods and services in an economy over a period of (20)
time. When the general price level rises, each unit of currency buys fewer goods and services. (36)
Consequently, there is an erosion in the purchasing power of money – a loss of real value of (53)
the currency within the country.

Inflation's effects on an economy are various and can be simultaneously positive and negative. (67)
Negative effects of inflation include increased risk in saving, uncertainty over the future which (81)
may discourage investment and savings, and, if inflation is rapid enough, shortages of goods (95)
as consumers begin hoarding out of concern that prices will increase in the future. Positive (110)
effects include ensuring that central banks can adjust real interest rates (intended to reduce (124)
the harmful effect of recessions) and encouraging investment in non-monetary capital projects. (136)

Some of the negative effects of inflation could have serious impact not only on the economy, but (153)
also on the social welfare of society at large. High inflation can prompt employees to demand rapid (170)
wage or salary increases, to keep up with consumer prices. Rising wages in turn can help fuel (187)
inflation. In other words, inflation causes further inflationary expectation, which causes further. (199)
inflation. This is called cost-push inflation in economics. Moreover, inflation can encourage hoarding. (212)
In this situation, people buy durable and / or non-perishable commodities and other goods to store (228)
them in the house in order to avoid the losses expected from the declining purchasing power (244)
of money, which in turn creates shortages of the hoarded goods. (255)

Inflation can lead to social unrest, public demonstration and revolutions. For example, inflation, (268)
and in particular food inflation, is considered one of the main reasons that caused the (283)
2010-2011 Tunisia revolution and the 2011 Egyptian revolution. Tunisian president Zine El (295)
Abidine Ben Ali was ousted. Egyptian president Hosni Mubarak was also ousted after (308)
eighteen days of demonstrations and protests which eventually spread to many countries (320)
of North Africa and the Middle East. (327)

Total words read _____ **Total errors** _____ **Total words** _____

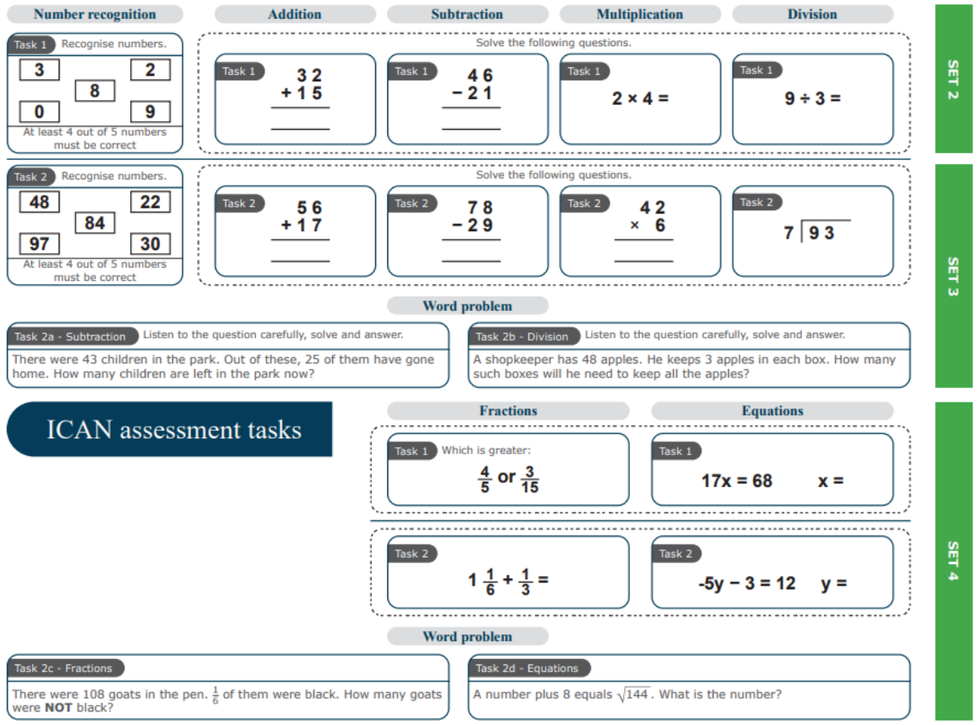
Comprehension Questions:

1. What happens to the buying power of currency when the general price level rises? *(A: Each unit of currency buys fewer goods and services.)*
2. During periods of inflation, many people begin hoarding goods. Why does this happen? *(A: Concerns that prices will rise in the future)*

(1)	(2)
___ Correct	___ Correct
___ Incorrect	___ Incorrect
___ Did not reach	___ Did not reach

Numeracy

International Common Assessment of Numeracy (ICAN+)



Appendix B: Tables

Table B.1: Programme effect on teacher practices, as reported by enumerators

Subskill	Baseline mean/SD	Expected outcome at midline for JSS 1	Treatment effect over expectation	% gain over "baseline" expectation
Time students spend on learning	1.3	1.47	-0.01	-1%
	(0.46)		(0.14)	
Supportive learning environment	2.12	2.32	0.04	2%
	(0.4)		(0.11)	
Positive behavioural expectation for students	1.78	2.42	-0.39**	-16%
	(0.63)		(0.18)	
Lesson facilitation	2.04	2.47	-0.32**	-13%
	(0.52)		(0.16)	
Monitor students' learning progress	1.96	2.22	-0.07	-3%
	(0.45)		(0.15)	
Provide feedback to students	2.03	2.37	-0.22	-9%
	(0.53)		(0.19)	
Encourage students' critical thinking	1.79	2.19	-0.26*	-12%
	(0.48)		(0.15)	
Promote autonomy in classrooms	1.76	2.11	-0.09	-4%
	(0.56)		(0.16)	
Encourage perseverance	1.93	2.31	-0.14	-6%
	(0.5)		(0.14)	
Promote students' social and collaborative skills	1.62	1.97	-0.09	-5%
	(0.55)		(0.15)	
Teacher is actively leading	0.94	0.98	-0.04	-4%
	(0.24)		(0.07)	
Enough materials for all students	0.55	0.59	0.07	12%
	(0.5)		(0.14)	
Motivate students	4.62	5.76	-0.34	-6%
	(1.96)		(0.47)	
Accurately lesson plan	3.31	4.32	1.47**	34%
	(2.48)		(0.57)	
Check student performance	4.44	5.77	0	0%
	(1.89)		(0.52)	
Respond to students	4.38	5.64	-0.28	-5%
	(2.13)		(0.48)	

Notes: Each item is scored on a scale of 1-3 or 1-9. Following the traditional difference-in-differences methodology, the expected outcome at midline is the growth observed in the comparison grades added to the baseline level for the treatment grade. Therefore, the treatment effect is the difference in the observed midline results for the treatment grades and the expectation for it, absent the treatment given the growth of the comparison grades. Standard errors clustered at the school-level. Statistical significance indicated as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table B.2: Treatment effects after terms 2 and 3 (school Year 2021-22) on foundational literacy, by subskill

Subskills	Treatment effect over expectation	% gain over "baseline" expectation
Words correctly read, passage 1	0.68	1%
	(5.06)	
Accuracy, passage 1	-0.01	-1%
	(0.04)	
Student read 0 words correctly, passage 1	0.01	8%
	(0.05)	
Words correctly read, passage 2	-0.5	-1%
	(4.74)	
Accuracy, passage 2	-0.01	-1%
	(0.04)	
Student read 0 words correctly, passage 2	0.01	7%
	(0.05)	
Average comprehension score	0	0%
	(0.23)	
Comprehension score, passage 1	-0.01	-6%
	(0.27)	
Comprehension score, passage 2	0.01	8%
	(0.24)	

Notes: Following the traditional difference-in-differences methodology, the expected outcome at midline is the growth observed in the comparison group added to the baseline level for the treatment group. Therefore, the treatment effect is the difference in the observed midline results for the treatment group and the expectation for it, absent the treatment given the growth of the comparison group. Standard errors clustered at the school-level. Statistical significance indicated as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table B.3: Treatment effects after terms 2 and 3 (school Year 2021-22) on foundational numeracy, by subskill

Subskills	Treatment effect over expectation	% gain over baseline expectation
Number recognition, simple	0	0%
	(0.01)	
Number recognition, complex	0	0%
	(0.02)	
Addition, simple	0.02	2%
	(0.04)	
Addition, complex	-0.06	-8%
	(0.05)	
Subtraction, simple	-0.02	-2%
	(0.04)	
Subtraction, complex	0.07	14%
	(0.06)	
Multiplication, simple	-0.02	-3%
	(0.06)	
Multiplication, complex	0.04	10%
	(0.07)	
Division, simple	0.07	13%
	0.08	
Division, complex	(-0.01)	-4%
	0.06	
Fraction, simple	0.05	50%
	(0.06)	
Fraction, complex	0.02	100%
	(0.03)	
Equations, simple	-0.01	-10%
	(0.04)	
Equations, complex	0	0%
	(0.02)	
Word problem involving subtraction	-0.09	-17%
	(0.08)	
Word problem involving division	-0.06	-24%
	(0.06)	
Word problem involving fraction	0.02	-
	(0.02)	
Word problem involving equation	0.02*	-
	(0.01)	
Foundational numeracy*	0.1	0%
	(4.53)	

Notes: Following the traditional difference-in-differences methodology, the expected outcome at midline is the growth observed in the comparison group added to the baseline level for the treatment group. Therefore, the treatment effect is the difference in the observed midline results for the treatment group and the expectation for it, absent the treatment given the growth of the comparison group. The subskills without a % gain over expectation did experience a gain among the comparison group and scored 0 at baseline, making it impossible to calculate this metric. Foundational numeracy is defined as whether a student is able to recognise numbers and do at least two of the other operations listed above. Standard errors clustered at the school-level. Statistical significance indicated as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table B.4: Difference in learning gains between schools with smallest JSS 1 enrolments and full sample

Subject	Subskill	Bottom 25 percentile	Full sample
Literacy	Reading fluency, passage 1	27.71**	0.68
	Reading fluency, passage 2	26.13**	-0.50
Numeracy	Complex addition	0.14	-0.05
	Complex subtraction	0.18	0.07
	Complex multiplication	0.11	0.04
	Complex division	0.19	-0.01

Notes: Standard errors clustered at the school-level. Statistical significance indicated as follows: * p<0.10, ** p<0.05, *** p<0.01.

Table B.5: Learning Outcomes in Literacy and Numeracy by Grade and Programme Year

Domain	Sub-skill	JSS 1		JSS 2	
		End of Year 1	End of Year 2	End of Year 1	End of Year 2
Reading fluency (cwpm)	Grade 7 passage	63.2	86.3	88.1	95.2
		(51.5)	(60.0)	(56.4)	(61.2)
	Grade-level passage	56.0	76.7	101.1	106.4
		(43.9)	(51.8)	-64.3	(65.6)
Non-readers (%)	Grade 7 passage	0.14	0.08	0.05	0.08
		(0.35)	(0.27)	(0.22)	(0.27)
	Grade-level passage	0.15	0.07	0.05	0.08
		(0.36)	(0.25)	(0.23)	(0.27)
Reading comprehension (%)	Grade 7 passage	0.18	0.24	0.21	0.31
		(0.32)	(0.36)	(0.34)	(0.41)
	Grade-level passage	0.13	0.22	0.32	0.5
		(0.28)	(0.35)	(0.35)	(0.43)
Foundational numeracy (%)	Number recognition (simple)	0.98	0.99	0.99	1.00
		(0.14)	(0.07)	(0.12)	(0.00)
	Number recognition (complex)	0.98	0.99	0.99	0.99
		(0.15)	(0.07)	(0.09)	(0.07)
	Addition (simple)	0.92	0.98	0.93	0.97
		(0.28)	(0.14)	(0.25)	(0.17)
	Addition (complex)	0.72	0.85	0.79	0.85
		(0.45)	(0.36)	(0.41)	(0.36)
	Subtraction (simple)	0.80	0.90	0.88	0.94
		(0.40)	(0.31)	(0.32)	(0.24)
	Subtraction (complex)	0.56	0.70	0.6	0.75
		(0.5)	(0.46)	(0.49)	(0.44)
	Multiplication (simple)	0.74	0.91	0.84	0.93
		(0.44)	(0.29)	(0.37)	(0.25)

	Multiplication (complex)	0.43	0.58	0.48	0.66
		(0.5)	(0.49)	(0.5)	(0.48)
	Division (simple)	0.59	0.80	0.61	0.85
		(0.49)	(0.40)	(0.49)	(0.36)
	Division (complex)	0.25	0.44	0.29	0.42
		(0.43)	(0.5)	(0.45)	(0.49)
	Fractions (simple)	0.16	0.29	0.22	0.28
		(0.36)	(0.46)	(0.42)	(0.45)
	Fractions (complex)	0.04	0.15	0.10	0.13
		(0.19)	(0.36)	(0.3)	(0.33)
	Equations (simple)	0.10	0.21	0.11	0.20
		(0.3)	(0.41)	(0.31)	(0.40)
	Equations (complex)	0.03	0.08	0.05	0.06
		(0.18)	(0.28)	(0.23)	(0.23)
Word problems	Involving subtraction	0.46	0.61	0.49	0.66
		(0.50)	(0.49)	(0.5)	(0.47)
	Involving division	0.19	0.39	0.24	0.45
		(0.39)	(0.49)	(0.43)	(0.50)
	Involving fractions	0.03	0.09	0.04	0.09
		(0.17)	(0.28)	(0.2)	(0.29)
	Involving equations	0.01	0.03	0.02	0.04
		(0.12)	(0.17)	(0.15)	(0.19)
Total maths score	Average all items	0.44	0.56	0.48	0.57
		(0.18)	(0.18)	(0.17)	(0.17)

Notes: Average shown above standard deviations. Standard deviations in parenthesis. Comparison subsetting to only the 50 initial treatment schools, across both rounds.

Table B.6: Learning Gains at End of Year 2, by Grade	Outcome	All	JSS 1	JSS 2
Literacy	CWPM (Grade 7 passage)	17.35	21.37	4.61
		(0.32)	(0.42)	(0.08)
	Share of non-readers (%) (Grade 7 passage)	-0.03	-0.05	0.02
		(0.09)	(0.15)	(0.11)
	CWPM (Grade-level passage)	18.68	19.41	1.93
		(0.33)	(0.45)	(0.03)
	Share of non-readers (%)	-0.04	-0.07	0.02
	(Grade-level passage)	(0.11)	(0.2)	(0.11)
	Reading comprehension (%) (Total)	0.12	0.08	0.10
		(0.4)	(0.29)	(0.33)
	Reading comprehension (%) (Grade 7 passage)	0.08	0.05	0.11
		(0.25)	(0.16)	(0.33)
	Reading comprehension (%) (Grade-level passage)	0.15	0.08	0.16
		(0.48)	(0.29)	(0.46)
Numeracy	ICAN (%) (Total)	0.10	0.11	0.08
		(0.57)	(0.6)	(0.48)
	Number recognition (%) (Simple)	0.02	0.02	0.02
		(0.12)	(0.11)	(0.12)
	Number recognition (%) (Complex)	0.01	0.02	0.00
		(0.1)	(0.13)	(0.04)
	Addition (%) (Simple)	0.06	0.07	0.04
		(0.21)	(0.24)	(0.15)
	Addition (%) (Complex)	0.10	0.13	0.06
		(0.24)	(0.28)	(0.14)
	Subtraction (%) (Simple)	0.09	0.09	0.06
		(0.23)	(0.23)	(0.17)
	Subtraction (%) (Complex)	0.13	0.12	0.13
		(0.27)	(0.25)	(0.27)
	Multiplication (%) (Simple)	0.15	0.16	0.10
		(0.35)	(0.37)	(0.26)
	Multiplication (%) (Complex)	0.15	0.13	0.15
		(0.3)	(0.27)	(0.3)
	Division (%) (Simple)	0.23	0.21	0.24
		(0.47)	(0.43)	(0.49)
	Division (%) (Complex)	0.17	0.19	0.14
		(0.39)	(0.43)	(0.31)
	Fractions (%)	0.10	0.13	0.05

(Simple)	(0.25)	(0.33)	(0.11)
Fractions (%) (Complex)	0.07	0.11	0.02
	(0.31)	(0.54)	(0.06)
Equations (%) (Simple)	0.09	0.11	0.07
	(0.29)	(0.34)	(0.22)
Equations (%) (Complex)	0.03	0.05	0.00
	(0.14)	(0.27)	(0)
Word problem (%) (Subtraction)	0.14	0.12	0.15
	(0.29)	(0.25)	(0.31)
Word problem (%) (Division)	0.21	0.20	0.20
	(0.5)	(0.49)	(0.46)
Word problem (%) (Fractions)	0.05	0.06	0.04
	(0.3)	(0.36)	(0.21)
Word problem (%) (Equations)	0.02	0.02	0.02
	(0.13)	(0.12)	(0.11)

*Treatment effects in standard deviation in parentheses.

Appendix C: List of schools for Years 1–2 sample

School name	District	LGA	Treatment status at baseline	Treatment status at midline
Afowa School	Edo North	Etsako West	Treatment	Treatment
Akoko-Edo School	Edo North	Akoko Edo	Treatment	Treatment
Army Jnr. School	Edo South	Ikpoba Okha	Treatment	Treatment
Arue School	Edo Central	Esan North East	Treatment	Treatment
Asoro School	Edo South	Egor	Treatment	Treatment
Avbiosi Grammar School	Edo North	Owan West	Treatment	Treatment
Azama School	Edo North	Owan East	Treatment	Treatment
Ebudin School	Edo Central	Esan Central	Treatment	Treatment
Ekperi School	Edo North	Etsako Central	Treatment	Treatment
Emaudo School	Edo Central	Esan West	Treatment	Treatment
Emotan College School	Edo South	Oredo	Treatment	Treatment
Emu, Emu School	Edo Central	Esan South East	Treatment	Treatment
Equare School	Edo Central	Esan West	Treatment	Treatment
Evbareke School	Edo South	Egor	Treatment	Treatment
Evbiamen School	Edo North	Owan East	Treatment	Treatment
Girls Mod. Abudu School	Edo South	Orhionmwon	Treatment	Treatment
Igiode School	Edo North	Etsako East	Treatment	Treatment
Igueben College School	Edo Central	Igueben	Treatment	Treatment
Iguomon Jnr School	Edo South	Uhunmwode	Treatment	Treatment
Ihievbe School	Edo North	Owan East	Treatment	Treatment
Ihogbe School	Edo South	Oredo	Treatment	Treatment
Ikao School	Edo North	Owan East	Treatment	Treatment
Ikhin School	Edo North	Owan East	Treatment	Treatment
Imaguero School	Edo South	Oredo	Treatment	Treatment
Iruekpen, Girls School	Edo Central	Esan West	Treatment	Treatment
Iyekeogba School	Edo South	Oredo	Treatment	Treatment
Iyekhie School	Edo North	Etsako West	Treatment	Treatment
Iyoba School	Edo South	Egor	Treatment	Treatment
Momodu College School	Edo North	Etsako West	Treatment	Treatment
Oba-Ovonramwen School	Edo South	Ovia South West	Treatment	Treatment
Obasuyi Jnr. School	Edo South	Ikpoba Okha	Treatment	Treatment
Obeidu School	Edo Central	Esan North East	Treatment	Treatment
Oghada School	Edo South	Uhunmwode	Treatment	Treatment
Ogute Oke School	Edo North	Etsako East	Treatment	Treatment
Ojirami-Dam School	Edo North	Akoko Edo	Treatment	Treatment
Opoji Grammar School	Edo Central	Esan Central	Treatment	Treatment
St. John Boco, Ubiaja School	Edo Central	Esan South East	Treatment	Treatment
Udakpa, Ubiaja School	Edo Central	Esan South East	Treatment	Treatment
Udo Mixed School	Edo South	Ovia South West	Treatment	Treatment
Uhonmora Commercial School	Edo North	Owan West	Treatment	Treatment
Ujemen School	Edo Central	Esan West	Treatment	Treatment
Ukhun School	Edo Central	Esan West	Treatment	Treatment
Uku School	Edo North	Etsako West	Treatment	Treatment
Uluoke School	Edo North	Etsako West	Treatment	Treatment
Uokha School	Edo North	Owan East	Treatment	Treatment
Urohi School	Edo Central	Esan West	Treatment	Treatment
Ute Jnr. School	Edo South	Ikpoba Okha	Treatment	Treatment
Utese School	Edo South	Ovia North East	Treatment	Treatment
Utoka School	Edo South	Ovia North East	Treatment	Treatment
Uzebba Grammar School	Edo North	Owan West	Treatment	Treatment
Adss School	Edo South	Ovia North East	Comparison	Treatment
Afeye School	Edo North	Akoko Edo	Comparison	Comparison
Afokpella School	Edo North	Etsako East	Comparison	Comparison
Amahor School	Edo Central	Igueben	Comparison	Comparison
Anglican School	Edo North	Akoko Edo	Comparison	Comparison
Egbeta School	Edo South	Ovia North East	Comparison	Comparison

Elewuare School	Edo South	Ovia South West	Comparison	Comparison
Esan Model Boys School	Edo Central	Esan North East	Comparison	Comparison
Ewossa Grammar School	Edo Central	Igueben	Comparison	Comparison
Girls Model, Ubiaja School	Edo Central	Esan South East	Comparison	Comparison
Igarra Girls School	Edo North	Akoko Edo	Comparison	Treatment
Ikobi School	Edo South	Orhionmwon	Comparison	Comparison
Ikoro, Ikon School	Edo South	Ovia North East	Comparison	Comparison
Ise, Utekon School	Edo South	Ovia North East	Comparison	Comparison
Iuleha Grammer Ugbegun School	Edo North	Owan West	Comparison	Comparison
Mixed Evboesi School	Edo South	Orhionmwon	Comparison	Comparison
Mixed Evbokabua School	Edo South	Orhionmwon	Comparison	Comparison
Mixed Igbanke School	Edo South	Orhionmwon	Comparison	Treatment
Mixed Ugboko/Niro School	Edo South	Orhionmwon	Comparison	Comparison
Nifor School	Edo South	Ovia North East	Comparison	Comparison
Oben School	Edo South	Orhionmwon	Comparison	Comparison
Ogbesse School	Edo South	Ovia North East	Comparison	Comparison
Oheze Oloten School	Edo South	Orhionmwon	Comparison	Comparison
Okogbo M.S.S School	Edo South	Orhionmwon	Comparison	Comparison
Okokhuo School	Edo South	Ovia North East	Comparison	Comparison
Orogho School	Edo South	Orhionmwon	Comparison	Comparison
Osagbe School	Edo North	Etsako Central	Comparison	Comparison
Osomhegbe School	Edo North	Etsako Central	Comparison	Comparison
Owan School	Edo South	Ovia North East	Comparison	Comparison
Owe School	Edo South	Orhionmwon	Comparison	Comparison
Ozulua Jnr. School	Edo South	Ikpoba Okha	Comparison	Treatment
Siluko School	Edo South	Ovia South West	Comparison	Comparison
Somorika School	Edo North	Akoko Edo	Comparison	Comparison
Ugbeka Evboeghai School	Edo South	Orhionmwon	Comparison	Comparison
Ugboha, Ugboha School	Edo Central	Esan South East	Comparison	Treatment
Ughoton School	Edo South	Ovia North East	Comparison	Comparison
Ugu Girls Umoghun School	Edo South	Orhionmwon	Comparison	Comparison
Umelu Jnr. School	Edo South	Ikpoba Okha	Comparison	Comparison
Uneah School	Edo Central	Esan Central	Comparison	Comparison
Urhonigbe G.S. School	Edo South	Orhionmwon	Comparison	Comparison

Appendix D: Reading Fluency Standards

Hasbrouck-Tindal reading fluency (Spring) norms

The Hasbrouck-Tindal Oral Reading Fluency Norms are widely used as a tool to benchmark appropriate student progress in English oral reading fluency given their developmental stage at different points during 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 students 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 student in the 50th percentile at this point of the school year.

	Oral Reading Fluency Norms (Correct words per minute)			
	25th percentile	50th percentile	75th percentile	Median average weekly improvement
Primary I	34	60	91	2.0
Primary II	72	100	124	1.6
Primary III	91	112	139	0.9
Primary IV	105	133	160	1.2
Primary V	119	146	169	0.8
Primary VI	122	150	177	
JSS 1	123	150	177	
JSS 2	124	151	177	

Appendix E: Mapping ICAN Results onto Global Performance Standards

Mastery of numeracy skills in the early grades plays a crucial role in a student's ability to form a strong academic foundation, which then contributes to the individual's opportunities for economic, social, and personal prosperity. Yet, despite its importance, it is often the case that students are performing far below expectations in mathematics. In fact, a third of the global population of students will complete their Primary school education without mastery of foundational numeracy (Sitabkhan and Platas, 2018). Therefore, it is important for policymakers to have visibility into student numeracy progress and to understand the amount of growth needed for students to achieve mastery of grade-appropriate skills before the end of their schooling careers. For this, researchers need an international performance standard which aggregates data on student competencies from a broad array of contexts so that student numeracy levels can be benchmarked against globally representative expectations and the actual performance of other contexts.

The Global Proficiency Framework (GPF) is a context-agnostic compilation of numeracy proficiency descriptors developed by the UNESCO Institute for Statistics and myriad contributing organisations. The "Global Proficiency Descriptors" (GPD) included in it leverage mathematics performance data collated from fifty countries to form a standardised definition of grade-appropriate numeracy skills. Mathematical competencies that may be demonstrated by students at a particular grade level, but exceed expectations for that grade level, are categorised as such, and underperformance is likewise attributed accordingly (UNESCO Institute for Statistics et al., 2023). As such, policymakers are granted the comprehensive insight necessary to manage expectations and implement a gradational approach to elevating student success in their particular education system. Furthermore, the GPF is recognised as the source material for tracking learning progression in alignment with Sustainable Development Goal 4, which underpins its utility for translating within-system mathematical proficiency analysis to effective policy decisions (UNESCO Institute for Statistics et al., 2023).

Given the prominence of the GPF to understand global numeracy standards, this study has created a crosswalk between each skill assessed via the International Common Assessment of Numeracy (ICAN), described in this report, and the grade in which children are expected to master that skill according to the GPF. The study team carefully identified the mathematical benchmarks in the GPF that most closely correspond with assessment items, based on both the exact problem and the skill that is assessed by each problem. The grade level at which assessed students should be reaching these benchmarks was then determined by referencing the grade level(s) described under the framework's "Meets Global Minimum Proficiency"[6] threshold. In the following table, the precise alignment between each assessed ICAN skill and the grade-level expectation, per the GPF, for sufficient ability to demonstrate this skill can be found:

[6] By design, this threshold is formed from a lenient definition of the level of proficiency students need to demonstrate the skill. Therefore, if an ICAN skill is assessed by a problem that is marginally more advanced than the corresponding GPD on the GPF, it is still reasonable to state that students would achieve this skill by the grade level designated by the GPD. Since the GPD describes the minimum level of skill a student can demonstrate that is still considered sufficient, it is likely that a significant proportion of students at this grade level would have stronger proficiency.

ICAN skill	Sample problem	GPF Grade-level expectation	Rationale[7]
Simple number recognition: One-digit number recognition	3, 0, 8, 2, 9	KG	G1: N1.1.1_M Count in whole numbers up to 30.
Complex number recognition: Two-digit number recognition	48, 97, 84, 22, 30	G1-2	G1: N1.1.1_M Count in whole numbers up to 30. G2: N1.1.1_M Count in whole numbers up to 100.
Simple addition: Two-digit addition without carrying	32 + 15 = ____	G2-3	G2: N1.3.1_M Add and subtract within 20 (i.e., where the sum or minuend does not surpass 20), and represent these operations with objects, pictures, or symbols. G3: N1.3.1_M Demonstrate fluency with addition and subtraction within 20 and add and subtract within 100 (i.e., where the sum or minuend does not surpass 100), with and without regrouping, and represent these operations with objects, pictures, or symbols (e.g., 32 + 59; solve an addition or subtraction problem presented by images of bundles of tens and ones; use number lines or skips on a hundreds grid to reason through or solve addition and subtraction problems).
Complex addition: Two-digit addition with carrying	56 + 17 = ____	G3	G3: N1.3.1_M Demonstrate fluency with addition and subtraction within 20 and add and subtract within 100 (i.e., where the sum or minuend does not surpass 100), with and without regrouping, and represent these operations with objects, pictures, or symbols (e.g., 32 + 59; solve an addition or subtraction problem presented by images of bundles of tens and ones; use number lines or skips on a hundreds grid to reason through or solve addition and subtraction problems).
Simple subtraction: Two-digit subtraction without borrowing	46 - 21 =____	G2	G2: N1.3.1_M Add and subtract within 20 (i.e., where the sum or minuend does not surpass 20), and represent these operations with objects, pictures, or symbols.
Complex subtraction: Two-digit subtraction with borrowing	78 - 29 = ____	G3	G3: N1.3.1_M Demonstrate fluency with addition and subtraction within 20 and add and subtract within 100 (i.e., where the sum or minuend does not surpass 100), with and without regrouping, and represent these operations with objects, pictures, or symbols.
Simple multiplication: One-digit multiplication without regrouping (exact multiplication)	2 x 4 = ____	G3	G3: N1.3.2_M Multiply and divide within 100 (i.e., up to 10 x 10 and 100 ÷ 10, without a remainder), and represent these operations with objects, pictures, or symbols.
Complex multiplication: Two-digit multiplication with regrouping	42 x 6 = ____	G5	G5: N1.3.2_M Multiply, with and without regrouping, and divide, with no remainder, any number by a one-digit number and multiply two, 2-digit numbers, with and without regrouping (e.g., 342 x 4 = __; 42 x 34 = __; 1380 ÷ 5 = __).

[7] In this column, the Global Proficiency Descriptors for each grade level are coded in accordance with which domain and where in the GPF they are located ("N" stands for "Number Operations" and "A" stands for "Algebra"). The "M" at the end of each descriptor's label indicates that this is the expectation for the "Meets Minimum Proficiency" level.

Simple division: Exact, one-digit short division with no remnant	9 ÷ 3 = ____	G3	G3: N1.3.2_M Multiply and divide within 100 (i.e., up to 10 x 10 and 100 ÷ 10, without a remainder), and represent these operations with objects, pictures, or symbols.
Complex division: Short division of a two-digit dividend by a one-digit divisor with a remnant	93 ÷ 7 = ____	G6	G6: N1.3.2_M Multiply any number by a 2-digit number, with and without regrouping, and divide any number by a 1-digit number, with and without a remainder (e.g., 3427 x 68; 1380 ÷ 6 = __).
Simple fractions: Recognition of the magnitude of fractions	Which is greater: 4/5 or 3/15	G5-6	G5: N2.1.3_M Compare and order fractions with different but related denominators up to 12. G6: N2.1.3_M Compare and order proper and improper fractions with different, unrelated denominators.
Complex fractions: Addition of a fraction and a mixed number	1 1/6 + 1/3 =____	G6	G6: N2.2.1_M Add and subtract improper fractions or mixed numbers with different but related denominators.
Simple algebraic equations: Solving for a variable requiring one step	17x = 68 x = ____	G6	G6: A3.2.1_M Find a missing value in a number sentence using any one of the four operations.
Complex algebraic equations: Solving for a variable requiring two steps	-5y - 3 = 12 y = ____	G7	G7: A3.3.1_M Represent and solve problems, including real-world problems, using a two-step equation with any of the four operations.
Subtraction word problem	There were 43 children in the park. Out of these, 25 of them have gone home. How many children are in the park now?	G4	G4: N1.4.1_M Solve simple real-world problems involving addition and subtraction of whole numbers within 100 (i.e., where the sum or minuend does not surpass 100) with and without regrouping, including problems involving measurement and currency units.
Division word problem	A shopkeeper has 48 apples. He keeps 3 apples in each box. How many such boxes will he need to keep all the apples?	G5	G5: N1.4.2_M Solve simple real-world problems involving the multiplication of two whole numbers to 10, and associated division facts.
Fractions word problem	There were 108 goats in the pen. 1/6 of them were black. How many goats were NOT black?	G5	G5: N2.3.2_M Solve real-world problems involving the multiplication and division of a proper fraction and a whole number.
Algebraic equations word problem	A number plus 8 equals √144. What is the number?	G7	G7: A2.1.1_M Use linear expressions to represent problem situations with a single variable (e.g., The cost of buying cinema tickets online is £12 per ticket plus a £2 booking fee. Write this as an expression where x is the number of tickets purchased). G7: A3.3.1_M Represent and solve problems using a two-step equation with any of the four operations (e.g., solve 3x + 4 = 22; Some people got on a bus, doubling the number of passengers. At the next stop, 8 people got off, leaving 16 people on the bus. Represent the situation as an equation, and solve to find the number of people on the bus originally.

Appendix F: Protocol for Collecting Qualitative Data in EdoBEST JSS — Post-Endline [September 2022]

Purpose and framing

The goal of this exercise is to understand what went well during the first months of the JSS 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 the EdoBEST JSS programme 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 the JSS programme 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 the JSS Programme?
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 the JSS programme? If so, how helpful do you think it is to teach JSS-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. 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 JSS methodology into your teaching? Even if you wanted to use this programme as you were trained on, what makes it hard to do so?
6. Did your school leader or your supervisor encourage you to engage with the programme? What do you think their attitudes towards the programme were?
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 to ensure that you are more effective in using these techniques?

Questions for head teachers:

1. First, what are your general impressions about the JSS Programme?
2. What do you think your **teachers**' general impressions about the JSS Programme are?
3. During its first year of operations, the EdoBEST JSS programme was rolled out only in JSS 1. Can you speak a little about how this dynamic played out on a day-to-day basis? How do you think the teachers that had to teach JSS 1 felt about being tasked with that, and how do you think that the teachers that had to teach JSS 2 and JSS 3 (without the EdoBEST JSS programme) felt about that?
4. Were there any tensions at the school as a result of only JSS 1 having the programme?
5. Think back to your conversations with your JSS 1 teachers throughout the last semester: what do you think their #1 complaint about the programme was?
6. How do you feel about the EdoBEST JSS programme moving into JSS 2 and JSS 3? Does this excite you, or do you not like this prospect?
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 the EdoBEST JSS programme 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 JSS methodology into the classroom?
5. During its first year of operations, the EdoBEST JSS programme was rolled out only in JSS 1. Can you speak a little about your observations on how this dynamic played out on a day-to-day basis? How do you think the teachers that had to teach JSS 1 felt about being tasked with that, and how do you think that the teachers that had to teach JSS 2 and JSS 3 without the programme felt?
6. Were there any tensions at the school as a result of only JSS 1 having the programme?
7. Think back to your conversations with your JSS 1 teachers throughout the last semester: what do you think their #1 complaint about the programme was?
8. When you provide teachers with feedback, how receptive have they been to this feedback?
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 that you are more effective in using these techniques?

Questions for parents:

1. In the past six months, have you noticed any changes in how your student's teacher teaches the class? If so, what are those changes?
2. In the past six months, have you noticed any attitude changes from your student's teacher? Do they seem more or less motivated? Are they coming to class more or less often? Any changes of this type?
3. What challenges do you think your student encounters at school every day to keep learning?

Questions for students:

1. In the past six months, have you noticed any changes in how your teacher teaches the class? If so, what are those changes?
2. In the past six months, have you noticed any attitude changes from your teacher? Do they seem more or less motivated? Are they coming to class more or less often? Any changes of this type?
3. What makes you excited about coming to school? *[this question is to positively prime them for the following question, so it's not such a negative transition]*
4. What makes learning at school hard? What challenges do you encounter at school every day to keep learning?

Sample data collection

We suggest that the collection of the data happens in an orderly and systematic manner. To do so, Priscilla Lu can support in the setup 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*
Questions 5	*Response*	[Not discussed]	*Response*
Questions 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 respondent, 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 G: An Overview of the Data Quality Assurance Protocol

Contextualising 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 students attending schools in low- and middle-income countries (LMIC). Transforming this distressing reality is a direct focus of NewGlobe's government-partnered education reform programmes. However, bringing student 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 student learning levels are within the broader scope of where they need to be. Students are scored based on the number of correct responses they provide, and the number of incorrect responses is also recorded. For literacy, we use two assessment passages provided by **Dynamic Indicators of Basic Early Literacy Skills** (DIBELS), which is widely regarded by researchers as an effective literacy measurement procedure. These passages work in tandem to provide insight into **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. The first assessment is a grade 2 passage, which all students (regardless of grade level) read, and the second is a grade-level passage tailored specifically to each student's respective grade. For both, students are scored based on the number of **correct words per minute** (cwpm), and incorrectly read words are also recorded. In order to assess student numeracy skills, we use the **International Common Assessment of Numeracy** (ICAN), which aligns with global standards for monitoring learning progress in LMIC, and tests students on the core skills of number recognition, addition, subtraction, multiplication, and division. With these tools, we can benchmark students' 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 students 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 it 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 Measurement and Evaluation (M&E) 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 student performance in the assessed skills.

In the interest of transparency and greater visibility into data-gathering performance patterns, the M&E 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 M&E 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 student 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 students 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 surpassing 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 M&E 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 M&E team will investigate the reliability of their findings accordingly.

Indicator 1: The share of observations showing that students 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 students 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 students in a given grade. These scores would fall well outside of the reasonable range — clearly above or below what is expected of students — 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 student 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 students 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 M&E 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 students 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 student across both passages.

Indicator 6: The share of observations containing ORF scores that are multiples of 5, or similar grouping patterns

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 students' 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 M&E 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 a 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 insights 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 H: The Learning Crisis in Low- and Middle-income Countries: An Overview of Causes, Contributors, and Consequences

Enrolment and literacy rates around the world have increased at record speed in recent decades

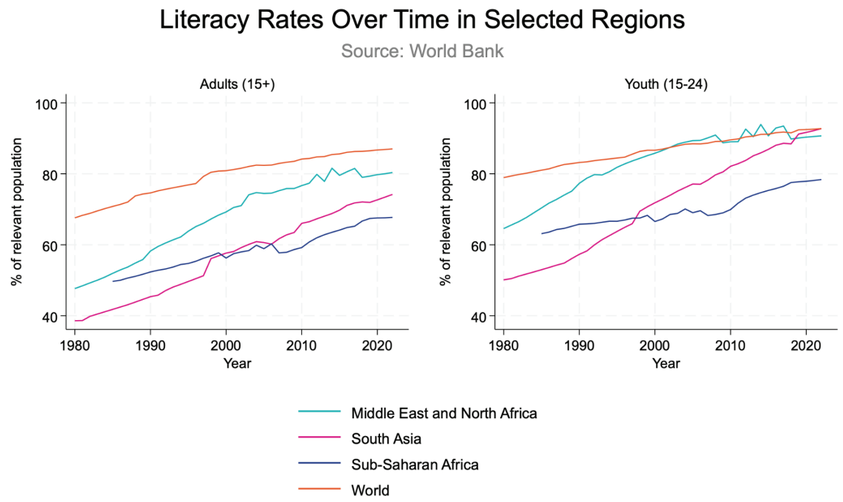
The growing global focus on broadening access to schools has led to significantly improved enrolment rates

Over the last 75 years, there has been a significant global shift towards expanding schooling infrastructure and enrolment outreach in an effort to achieve universal education. As a result, more children are in school today than at any other time in history — both in absolute and relative numbers (World Bank, 2018). Of the nearly 2 billion children under 14 years of age worldwide, 80% are now enrolled in school, with the majority living in low- or middle-income countries (LMIC). In LMIC in particular, nominal enrolment rates have increased at unprecedented speeds, now reaching near-universal levels (Pritchett, 2013).

For example, it took Bangladesh only 20 years to achieve nearly universal gross enrolment, growing by 33 percentage points between 1987 and 2007, starting from 65%. Similarly, Pakistan reduced the proportion of out-of-school children from 1 in 3 to 1 in 6 over the 2001-2021 period (World Bank, 2024c). Morocco saw an impressive 54% increase in girls' enrolment over 11 years — a feat that took the United States 40 years to accomplish. More broadly, between 1970 and 2010, the gross Primary enrolment rate in sub-Saharan Africa and South Asia surged from 68% and 47%, respectively, to over 100% in both regions (World Bank, 2018). These remarkable gains illustrate the successful efforts of countries worldwide to match enrolment rates in high-income nations, reflecting a global commitment to the importance of education.

Increased enrolment has been accompanied by growth in literacy rates

With ever-larger shares of the population being exposed to formal schooling, officially reported literacy rates have increased dramatically. Globally, literacy rates more than doubled, from 42% in 1960 to 86% in 2015 (Roser and Ortiz-Ospina, 2013). Along with expanded access, this represents a remarkable achievement in expanding educational access.



Despite successes in expanding enrolment and raising literacy rates, more progress is needed

Barriers to enrolment still persist

Access to schooling is a crucial prerequisite to learning, and the rapid, worldwide increases in enrolment in recent history are cause for hope. However, enrolment is still not universal; 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 COVID-19 pandemic further exacerbated this situation, with school closures keeping out almost 1.6 billion children (Azevedo, 2020), and even after schools reopened, many students never returned (UNICEF, 2023b; Mighati, 2022).

Several barriers to enrolment persist. In some contexts, 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, or are barred by impassable terrain or issues of travel safety. In other contexts, even government-led schooling is not free and/or compulsory, or comes with associated fees for school uniforms, meals, or textbooks – the cost of which can be prohibitive for many prospective students and their families (Abdul Latif Jameel Poverty Action Lab, 2019; Oyekan et al., 2023).

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 students will drop out of school or will not transition to higher grades or levels of education if they are not academically thriving (Pritchett, 2013), and the responsibility of ensuring the scholastic achievement of all students falls on the education system, to a far greater degree than it is dependent on students' backgrounds or characteristics (OECD, 2012; Eble and Escueta, 2022). Ultimately, failure to ensure adequate student retention and attainment has negative implications for both the education system and for students. It is more costly for education systems to devote educational resources to students who must repeat grades or who ultimately withdraw from formal education, and 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).

Access to education must start with early childhood

While great progress has been made in recent decades towards enrolling larger numbers of school-aged children, children in many contexts enter school later than the intended age, which can profoundly impact the rate at which they master skills during their academic careers and how well they develop into adulthood. For example, in Guinea-Bissau, more than three quarters of children in Primary school are over-age (UNESCO, 2023b), and this is largely due to late enrolment, with only 30% of children beginning school at the specified age of six (Borgen Project, 2021). In Nigeria, 1.8 million children were attending Primary school after the age of 11 during the 2018-2019 school year (Sasu, 2022). A 2017 study conducted in Uganda found that student ages in the final year of Primary school ranged from 12 to 22 years, with most students being 16 years old (Nath et al., 2017). In some contexts, late entry is a result of positive systemic changes that have broadened access to education (World Bank, 2020a) by making schooling available to children who were previously barred from it. However, in the long term, it is more advantageous for students to be equipped with school readiness by entering a learner-centred environment as early as possible — ideally through early childhood development education (Sosu and Pimenta, 2023). This plays a critical role in ensuring that students keep pace with curricular expectations, thereby maximising their potential throughout their academic careers and beyond.

Box 4. Investing in Early Childhood Education as a Foundation for Future Learning and Economic Returns

Early childhood education — systemic services designed to foster early learning before Primary education — represents one of the most impactful socioeconomic investments a government can make. The formative years from birth to age five are critical for the development of working memory, cognitive flexibility, and empathy, providing a unique opportunity for early cognitive and socio-emotional growth that significantly influences a child's academic future (Diamond, 2013). Research consistently shows that preschool cognitive skills can predict later educational outcomes, such as enrolment in secondary education, in diverse contexts including Guatemala and The Gambia (Palacios, 2022; Milosavljevic et al., 2023). These benefits extend to Primary education, where children who have participated in early childhood programmes exhibit higher attendance rates, better academic achievement, and are less likely to repeat grades or require remedial support (Berlinski and Schady, 2015; Naudeau et al., 2011). Thus, investment in early childhood education pays large academic dividends later in children's lives.

Given the significant returns early childhood education can yield, particularly in systems with low learning outcomes, it is clear that investments in this sector can be highly advantageous. This is true economically as well as academically; high-quality early childhood programmes can yield up to a 13% annual return per child (Heckman, 2007), through reduced dropout rates and the development of a more productive workforce. Additionally, large-scale construction of pre-Primary schools and childcare subsidies in low-income communities has been shown to boost maternal employment, further strengthening the workforce (Berlinski & Galiani, 2005, Green & Mostafa, 2011). Despite the need for substantial initial investments to scale and enhance pre-Primary education, the long-term macroeconomic benefits generally surpass the costs, offering a promising return on investment for governments and stakeholders (Sawhill et al., 2006). That said, these benefits can only be realised if pre-Primary education is made accessible, particularly to low-income families.

Particularly in low- and middle-income countries with under-resourced education systems, there are not enough accessible early childhood education programmes for all children to benefit. As of 2020, global enrolment in early childhood education programmes was estimated to be 61% (World Bank, 2024a). Furthermore, in many contexts where these programmes have expanded, it has occurred without a comprehensive and coherent systems approach. The absence of adequate teacher training and support, quality curricula, and quality assurance frameworks has led to fragmented expansion and inadequate quality. Expanding access to early childhood education without sufficient quality constitutes an inefficient use of limited resources that may bring about negligible or even detrimental effects on learning. Yet entry and training requirements, as well as training opportunities for early childhood education teachers, are often the lowest in education systems. Even with low entry requirements, just 44% of early childhood education teachers in low-income countries have received at least the minimum pre- and in-service training required for teaching at the early childhood education level in their country, compared with 72% of Primary teachers (UNESCO, 2020).

High-quality early childhood education programmes are a high-yield, cost-effective tool through which governments can bolster student achievement, national economic progress, and educational efficacy. Broadening access to early childhood education and investing in the structures that will ensure quality will be a critical component of equipping future generations with the ability to meaningfully contribute towards shaping a better future.

Despite the value of investing early in children's lives, 250 million children in low- and middle-income countries (LMIC) were found to be developmentally at risk in 2016, partly due to a lack of early learning programmes — a figure alarmingly similar to that of children out of school entirely in 2019 (Black et al., 2017; UNESCO, 2019). Similarly, UNICEF (n.d.) reports that developmental delay affects 43% of the population under the age of 5. This highlights a pervasive, systemic issue that has seen little improvement over the last decade — an issue that begins with pre-Primary programmes and continues to hinder retention in later years of schooling across education systems. Low enrolment in early childhood education remains widespread: Over 4 in 10 age-appropriate children worldwide were not enrolled in pre-Primary school in 2020, and the vast majority of countries do not include it in free and compulsory education (UNESCO, 2022). For children to succeed academically, it is imperative that they start with a strong foundation. At this formative stage of cognitive development, children benefit greatly 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 as it yields the highest return on investment compared to all other stages of schooling and contributes to a smoother-running Primary education system by preparing students to participate meaningfully (UNICEF, 2019).

Students should have the opportunity to enter school at the earliest possible stage to begin their path to becoming lifelong learners, and education systems must be ready to provide them with high-quality education through strong teacher professionalism and accountability — starting with early childhood programmes, appropriately levelled curricula, and environments dedicated to learning. While evidence suggests that most LMIC are nearing their goals of universal access to Primary schooling, this is not the case for early childhood programmes. Ensuring a strong foundation from before Primary school, at the developmentally appropriate age, is a crucial next step for education systems to maintain their current progress and transition from merely increasing schooling to enhancing learning.

Enrolment is necessary but not sufficient

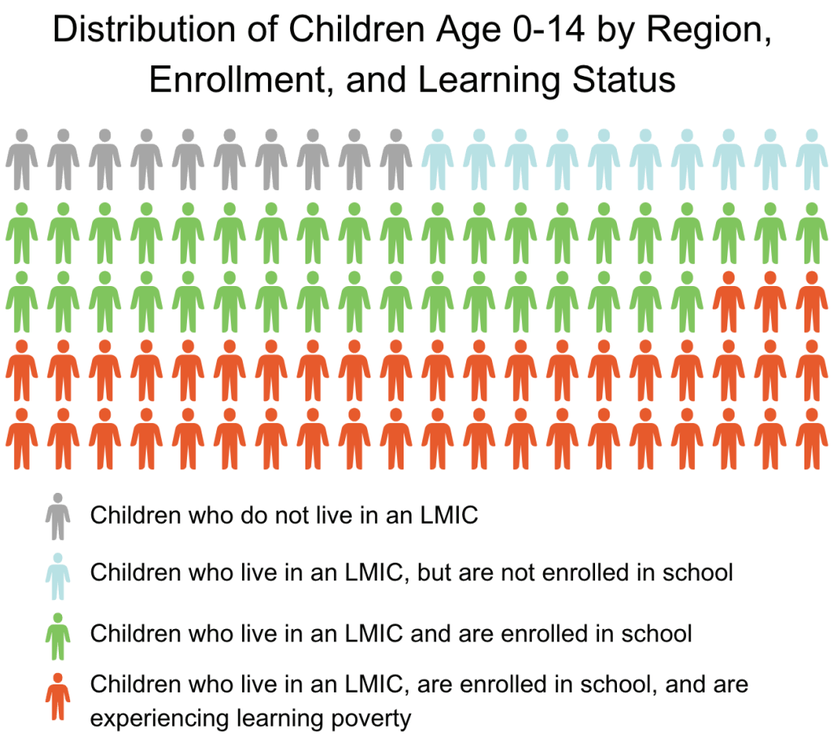
Focusing solely on enrolment is not sufficient to ensure that children are actually learning. The goal of universal education is not merely about superficially exposing children to educational institutions; it also requires that these institutions effectively equip students with the foundational skills necessary to function as members of a knowledge-based economy and to lead fulfilling lives (Pritchett, 2013). The alarming reality is that, despite the unprecedented number of children attending school for longer periods, many are still not mastering the skills they need to excel. This lack of learning, despite many children being enrolled in school, is the defining characteristic of the current learning crisis – and affects most countries around the world.

"This lack of learning, despite many children being enrolled in school, is the defining characteristic of the current learning crisis - and affects most countries around the world."

The rapid increase in enrolment in recent years, coupled with the learning crisis, presents both a policy opportunity and a serious risk. On the one hand, inaction means that more resources will need to be spent on maintaining underperforming education systems that do not yield the returns in human capital that will fuel economic growth and innovation. On the other hand, the greatly expanded access to schooling also provides an opportunity for positive impact on an unprecedented scale. Capitalising on the progress made in bringing children into schools as a crucial first step, policymakers can now implement interventions aimed at improving education quality, so that children in schools actually learn.

Progress is needed on true measures of literacy

As mentioned before, a notable success in recent decades is the doubling of global literacy rates between 1960 and 2015 (Roser and Ortiz-Ospina, 2013). That said, while literacy rates are often used as a measure of education quality, they provide an incomplete — and often overly optimistic — picture of learning outcomes globally. In particular, official literacy rates in LMIC can be misleading due to variations in measurement methods — including self-reporting of literacy levels, which often inflate actual proficiency levels and reflect a level of optimism that does not match the levels of actual reading proficiency. 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 Pakistan, the youth illiteracy rate for people aged 15-24 was 73% in 2019, while only 23% of children could read with comprehension (World Bank, 2023).



In this context, it is crucial to examine what exactly defines "literacy." Some definitions — including, implicitly, most official ones — describe it simply as a single, often low, threshold to cross, rather than as a framework within which students should develop the skills to navigate and grow. From an academic perspective, this type of benchmark for achievement may be set too low to ensure substantial returns on subsequent investments on education. Therefore, even if official literacy statistics suggest that a significant portion of a population is nominally literate, it is important to recognise that, in most cases, the majority of youth worldwide remains far from achieving the ultimate goal of literacy: reading comprehension. This skill, which involves extracting meaning from and applying the purpose of a text, is what enables students to progress *from learning to read* to *reading to learn*.

In the global effort to address the learning crisis, progress is needed on true measures of literacy. Students must be able to understand written class materials in school if they are to gain subject-specific content knowledge and develop more advanced skills. Citizens must be able to comprehend what they read if they are to be civically and economically engaged. Thus, education systems - particularly those that are faced with the opportunity to impact large numbers of new students - must go beyond merely raising literacy rates by superficial measures, and teach students how to *read to learn*.

Learning outcomes are weak and urgently require transformative interventions

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

Ensuring that children have access to school, start school at a developmentally appropriate age, and remain in school for the expected duration is a substantial undertaking. However, success in these areas alone does not guarantee that students are receiving an education that will adequately 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, persistently low learning levels are prevalent in all low- and middle-income countries (LMIC), where over half of all children experience "learning poverty" according to the World Bank, despite the fact that most of them are attending school. Moreover, this regional average conceals the severity of the problem in specific areas, such as sub-Saharan Africa, where learning poverty is estimated at approximately 90%, and in the Middle East, North Africa, and South Asia, where more than 6 in 10 children do not meet the minimum expected proficiency levels. These shortfalls in learning outcomes among enrolled students indicate insufficient education quality, which prevents them from mastering increasingly complex curricular expectations and may lead to their eventual withdrawal from school.

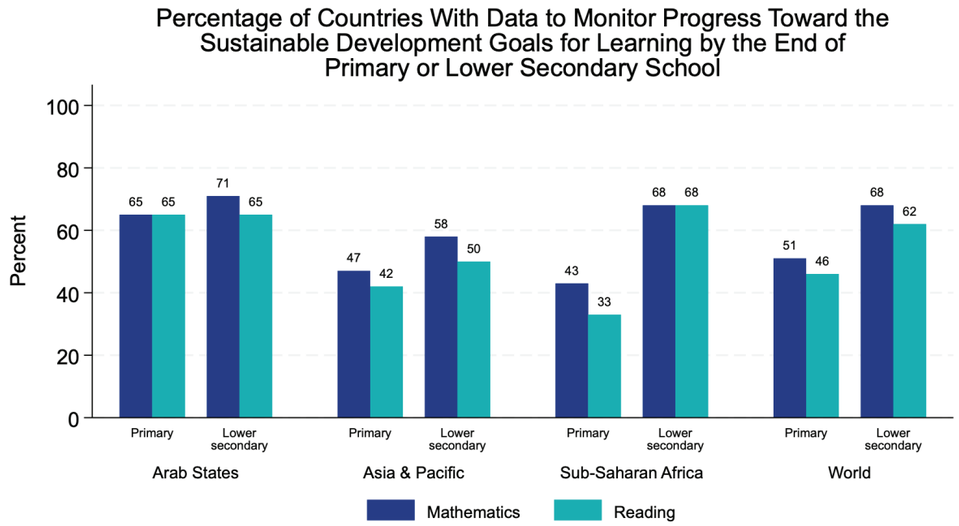
Literacy, the most extensively studied foundational skill, can also be examined among students in LMIC. Competency in this domain is essential for students to follow written instructions, engage with learning materials, participate in assessments, and gain knowledge in every core subject. However, evidence indicates a widespread lack of proficiency in many early-grade subskills that are fundamental to literacy. For example, in Pakistan in 2023, half of Grade 5 students were unable to read a story in Urdu considered appropriate for a Grade 2 curriculum (ASER Pakistan, 2024). Similarly, 80% of Grade 2 students 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 assessing literacy using a three-sentence passage and lowering the threshold, 75% of students in Nigeria, Uganda, and Bangladesh did not qualify as literate by the end of Primary school (World Bank, 2018). Despite widespread recognition of the benefits of literacy and the negative consequences of illiteracy, there remains a pervasive lack of proficiency in this essential skill among students within and across education systems.

Problematic literacy rates are mirrored by numeracy rates, which could also significantly hinder students' ability to function in their daily lives. For instance, 50% of all third graders in Uganda cannot solve simple subtraction problems. In rural India, 54% of third graders cannot complete double-digit subtraction, and by Grade 5, half of these students still cannot solve the same operations (World Bank, 2018). Similarly, only 60% of students in urban Pakistan could correctly perform double-digit subtraction by Grade 3, a figure that drops to 40% for the same grade level in rural areas. The lack of numeracy proficiency seen in these contexts extends to broader regions as well. For example, across sub-Saharan Africa, the Middle East, and North Africa, the average percentage of students who score above the minimum proficiency level on a mathematics assessment is between 18% and 42% (World Bank, 2018). While the specific interventions needed to elevate foundational numeracy learning will vary based on the context of each education system, the urgent need to address low learning levels is clear.

Moreover, without the implementation of effective policy solutions to improve learning outcomes, vast amounts of educational resources will continue to be expended without a meaningful return on investment. Globally, for instance, 125 million students who have completed four years of schooling still lack functional literacy or numeracy skills, demonstrating a widespread failure to achieve desired educational outcomes — through no fault of their own — despite the investment in them. This calls for targeted, transformative approaches to address the ongoing learning crisis and to ensure that education funding yields its expected benefits — especially crucial in the aftermath of the economic downturn triggered by COVID-19 (United Nations, 2020).

"Without the implementation of effective policy solutions to improve learning outcomes, vast amounts of educational resources will continue to be expended without a meaningful return on investment."

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



Source: World Development Report 2018 Data

Year-on-year improvement is too slow for students to keep pace with their high-performing peers

Compounding the problem of non-universal enrolment, late enrolment, and low levels of foundational literacy and numeracy, students in LMIC are not making yearly progress at a pace that puts them on track to meet curricular expectations in their own countries, or to catch up with their peers in HIC. Currently, high-performing students 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 student learning would not result in globally comparable content mastery in a reasonable number of decades (World Bank, 2018; Pritchett, 2013). According to a simulation by the World Bank, it would take an estimated 50 years just for LMIC to halve current levels of learning poverty (Azevedo, 2020).

The evidence clearly indicates that generations of students are at risk of continuing to lag behind expected learning levels. However, rapid improvement on a large scale is attainable. If every LMIC in the world were to produce learning gains at a rate that doubles or triples their historical progress, learning poverty would be reduced by almost half by 2030 (Azevedo et al., 2021), which would be an 82% reduction in the counterfactual projection of time needed to meet this goal. Given this, the critical dual objective of education systems in LMIC is to not only achieve large learning gains, but also augment the pace at which they are achieved.

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 reverse learning losses 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 student 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 have increased 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 long school closures are correlated with a more pronounced decline in learning, the availability of distance learning technologies also played a significant role in students' 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 at home (World Bank, 2023). While other at-home learning models were employed that did not require internet connectivity — such as radio lessons, televised lessons, or take-home packages — these did not allow teachers to verify student engagement, nor did they enable teachers to track student understanding of subject matter (World Bank, 2023). In this sense, the trade-off education systems faced when innovating distance-learning approaches to reach a greater number of students was the inability to manage these students' mastery of lesson content in real-time.

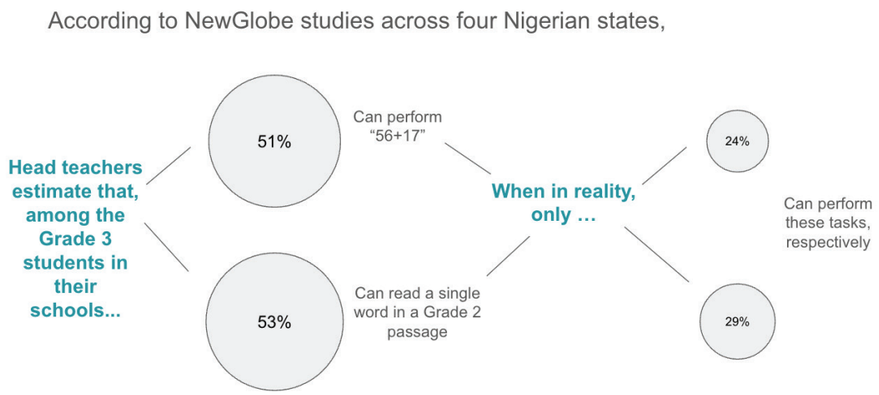
As a result, many students across LMIC learned less than they would have if participating in conventional, in-person instruction; therefore, more students demonstrated lower learning levels from 2020 onward. In Brazil, for example, some students participating in at-home learning absorbed only 28% of 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 students 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 students 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 students on a worldwide scale (United Nations, 2020), with the most significant consequences for students 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 a number of solutions involving structured pedagogy, edtech-based solutions, targeted instruction, among others, that aspire to reclaim a positive learning trajectory on an accelerated timeline (UNESCO et al., 2021).

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 students 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 students.

Policymakers often underestimate the extent of the learning crisis

Given the limitations of officially reported literacy rates as metrics for education quality, the lack of reliable learning data at both macro and micro levels in many education systems, and the prevalence of large class sizes, it is not surprising that many policymakers and school officials around the world significantly underestimate the scale of learning gaps in their own contexts. For example, a study involving 931 interviews with officials in sub-Saharan Africa and the Asia-Pacific regions revealed a widespread overestimation of

student proficiency in foundational skills by policymakers. This study found that, on average, policymakers believed that twice the actual proportion of students had attained foundational literacy compared to the figures determined using the World Bank's Learning Poverty indicator (Crawfurd et al., 2021). Similarly, several large-scale studies led by NewGlobe across four Nigerian states (Anambra, Enugu, Jigawa, and Oyo) confirmed the gross overestimation of learning levels even by head teachers regarding their own students. For example, while head teachers estimated that 51% of their Grade 3 students could solve "56 + 17", a Grade 2 skill in the Nigerian curriculum, only 24% could actually do so. Moreover, consistently across the four states, the gaps between head teachers' estimates and actual student performance were significantly larger among the lowest-performing schools.



The mismatch between the beliefs of different stakeholders within education systems worldwide and the actual performance of the students they serve is concerning for at least two reasons. First, it highlights the systematic lack of reliable large-scale assessment data on learning outcomes, as well as the absence of best practices in formative assessments to diagnose critical areas of improvement at both macro and micro levels within systems. Secondly, the overestimation of students' actual skills by policymakers, head teachers, and teachers likely contributes to the slow progress towards implementing concrete programmes aimed at improving learning outcomes. For example, Crawfurd et al. (2021) found that while four in five interviewed officials (79%) acknowledged that the learning crisis affected both their own country and the globe, only 2% considered foundational reading or literacy programmes as the most significant recent educational reform in their context. Moreover, overly positive perceptions of students' skills in foundational literacy and numeracy were strongly correlated with a reduced motivation to focus on reform in these areas. Consequently, the relative lack of policy focus aimed at strengthening core student competencies may stem from an overly optimistic view of the state of learning, driven by inadequate visibility into accurate measurements of educational outcomes.

"The overestimation of students' actual skills by policymakers, head teachers and teachers likely contributes to the slow progress towards implementing concrete programmes aimed at improving learning outcomes."

Increased heterogeneity in learning levels poses a new challenge

Recent successes in raising enrolment rates have brought many children into classrooms who would otherwise not have enrolled in school. This has created a new challenge for education systems: how to educate larger and more heterogeneous groups of students. Multiple levels of heterogeneity exist, and have distinct implications. Heterogeneity *within classrooms* requires teachers to tailor their instruction to a wider range of proficiency levels within their classrooms (Ganimian & Djaker, 2023). Additionally, heterogeneity *between classrooms or between schools* - where learning levels vary widely across classrooms or schools within an education system (Rodriguez-Segura & Tierney, 2024) – poses challenges for central planners who must set appropriate curricular levels system-wide, and/or establish guidelines for schools to diverge from the central policy prescription.

Heterogeneity in students' preparation *within* a classroom makes teaching more challenging, especially in contexts of low teacher capacity, where teachers may already be taking on larger class sizes or have less systemic support. Education systems have adopted a variety of strategies that can reduce heterogeneity, and some have been more effective than others (Ganimian & Djaker, 2023). Expanding access to high-quality early childhood education – with the idea that it can foster a stronger foundation for Primary school – has been successful in improving learning outcomes in upper-middle-income countries (Berlinski et al., 2009), though less so in lower-middle- and low-income countries (Bouguen et al., 2018; Blimpo et al., 2019). Similarly, providing reports for principals and school leaders on their students' performance in maths and language – either as standalone information or in combination with other interventions such as training to design improvement plans based on the data – have proven effective in UMIC and less so in LMIC (Muralidharan & Singh, 2022; de Hoyos et al., 2022).

Providing the lowest-performing students with opportunities to catch up with their higher-performing peers can reduce the need for teachers to cater to a wide range of academic needs within a classroom (Banerjee et al., 2007; Álvarez-Marinelli et al., 2021). Using technology to differentiate instruction – by presenting different material to students at different preparation levels – has had limited success; providing students with hardware, either by itself or pre-loaded with educational software intended for use in independent self-paced learning, has typically failed to improve learning outcomes (Cristia et al., 2017). What has been effective, however, is combining technology-based solutions with pedagogy that is responsive to students' current levels. Software that dynamically adjusts the content and difficulty of the material based on students' performance – as contrasted with pre-loaded, static content – had moderate to large impacts on achievement (Muralidharan et al., 2019).

Just as within-class heterogeneity can create challenges for teachers in delivering effective instruction to every student, heterogeneity across schools can pose similar challenges for central planners in setting curricular levels for entire education systems. On the one hand, a one-size-fits-all approach to curriculum setting, even if moderately well-calibrated to learning levels within an education system, risks leaving behind many children on both ends of the distribution. One recent study examines the extent of between-school heterogeneity in six education systems (Rodriguez-Segura & Tierney, 2024) – and finds that learning levels, though low overall, can show considerable variation by school. It also finds that the degree of heterogeneity increases with grade, and varies by subject. In systems with a high degree of between-school heterogeneity, customising the instructional level of the curriculum for the needs of different schools given their baseline levels of performance could enable the education system to reach a significantly higher share of children through appropriate instruction. Yet, such an intervention would require an agile system of assessment and material distribution that does not exist in many countries, and that current governance systems may not be equipped to deliver.

The Causes of Weak Learning Outcomes are Many

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

The most visible manifestations of government efforts to enhance educational opportunities for the growing number of students in their systems have often focused on input-based solutions, particularly as a perceived alternative to improving quality when education systems fail to meet established standards. A lack of tangible resources – such as paper, textbooks, or technological hardware – in some schools has been regarded as a significant barrier to improving learning. In some cases, this concern is valid; for instance, one study found that less than half of all students in Niger and Nigeria had paper to write on, while there was only one maths textbook for every 66 students in Togo (World Bank, 2010–2014). Such deficiencies can hinder the learning process, especially when instructional efficiency is limited. In this sense, inputs are necessary to a degree, but they are not sufficient as a standalone improvement effort.

Despite the shortage of certain materials that may act as prerequisites for strong learning outcomes in many education systems worldwide, the mere injection of resources into classrooms and schools has not been shown to result in higher levels of academic achievement and may even act as a detractor. In other words, if the specific factors inhibiting learning gains in a school have not been identified, indiscriminate expenditures may have little effect, while existing problems persist. For example, in 2008, textbooks distributed to schools in Sierra Leone were discovered unused in a cupboard during a follow-up inspection. Speculation suggests that teachers were hesitant to risk damaging these rare resources (World Bank, 2018), but their lack of use represents a missed opportunity for student learning and signifies non-cost-effective spending on education improvement. Another, more far-reaching example is the One Laptop per Child (OLPC) initiative, which was an ambitious effort to enhance learning via technology access in over 42 countries (Yanguas, 2020). However, one year after successful distribution, nearly half of the teachers reported rarely or never using the laptops in the classroom (World Bank, 2018). Various studies across parts of the developing world have shown neutral or negative effects on academic outcomes stemming from OLPC. In some cases, students spent 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, indicating that the introduction of educational technology hardware only has a 6% positive effect on student learning, while the remaining 94% of the effect is either neutral or negative.

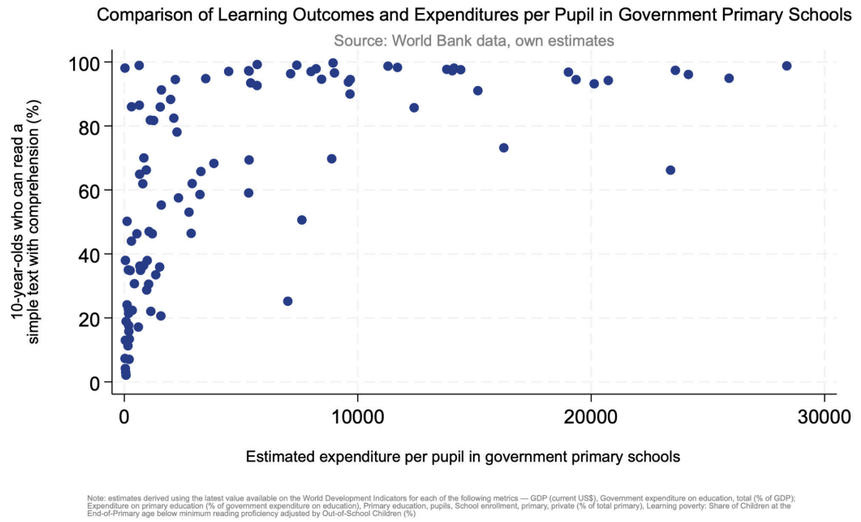
In response, it is imperative for education systems in LMIC to maintain momentum with holistic and proven-effective approaches, so that gaps in educational achievement do not widen during misdirected pursuits. Furthermore, curricular design should justify how and why material or technological inputs are used. These resources must fortify pre-existing teacher-learner relationships as complementary tools, not substitutes (World Bank, 2018). In this sense, while targeted, scaled investments in education are needed to improve learning outcomes, misguided efforts to enhance schooling through simple increases in inputs like books or computers will at best lead to wasted resources, and at worst, exacerbate already-problematic learning levels.

In countries where overall educational spending is relatively low by global standards, *how* resources are used is more important than *how much* is spent.

Governments worldwide have dedicated significant resources to their education systems, especially in response to the rapid increases in enrolment over recent decades. For instance, while the number of Primary school children globally rose from 502 million in 1978 to 732 million in 2018, the pupil-teacher ratio decreased from 29 to 23 over the same 50-year period, demonstrating countries' commitment to matching "inputs", in this case teachers, with enrolment growth. Given the considerable investment and the potentially high opportunity cost for other development initiatives, it is crucial that these resources be used effectively to ensure that any level of government spending translates into improved learning outcomes.

In general, there is a positive correlation between higher investment in education and improved educational outcomes. For example, a 1% increase in the share of GDP spent on education correlates with a 5.6 percentage point reduction in learning poverty. More tangibly, each additional USD 100 spent on Primary pupils in government schools reduces nationwide learning poverty by approximately 0.3 percentage points.

However, this relationship between educational investment and learning outcomes is not linear. For instance, among countries spending less than USD 5,000 per pupil annually in public Primary schools, there is considerable variation in learning outcomes, even with similar spending levels. For instance, Tunisia and Georgia both spend between USD 600 and 700 per pupil, yet their learning poverty rates differ greatly; while the learning poverty rate in Georgia is only 14%, the learning poverty rate in Tunisia is nearly 5 times that at 66%. This variation among lower-spending countries underscores the importance of prudent financial allocations towards initiatives that can genuinely enhance education quality without incurring excessive costs.



Achieving efficient use of educational investments requires ensuring that resources in LMIC are directed towards evidence-based interventions that have demonstrated impact on learning gains, making the investments, in turn, cost-effective. In other words, *how* allocated resources are used is more critical than *how much* is allocated, up to a certain threshold. For effective decision-making that maximises cost-effectiveness, educational resource allocation should prioritise strategies that yield measurable results rather than those with high visibility. Approaches that build a solid foundation in literacy and numeracy before focusing on other more visible academic inputs have produced positive results in many contexts, and hold the potential for large returns on investments in LMIC. By focusing on effective, proven interventions, increased investments in education by currently low-spending countries can lead to improved learning outcomes for future generations who will fuel their countries' economic growth.

"Achieving efficient use of educational investment requires ensuring that resources in LMIC are directed towards evidence-based interventions that have demonstrated impact on learning gains, making the investments, in turn, cost-effective."

Importantly, policymakers and education personnel alike should be prepared to recognise that reforms targeting pedagogical improvement and increased accountability are not always as visible as input-based policy changes such as the building of new schools or efforts to increase enrolment and attendance. Nonetheless, the appropriate interventions have the potential to drive unprecedented gains in learning, which is the strongest indicator of a policy'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.

Low teacher content knowledge can translate into poorly executed pedagogy

Teachers are central to what can be achieved in any classroom and are the most influential factor across all education systems (Vegas, 2020). Their professional competence and the rapport they build with students enables them to assess learning levels and help students reach their academic potential. However, in some LMIC, teachers may lack the content knowledge needed to effectively support struggling students. For instance, in 14 sub-Saharan African countries, teachers performed at the same level on reading tests as their highest-performing Grade 6 students (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' subject knowledge can negatively impact student achievement. In some cases, as much as 30% of students' failure to meet curricular expectations was attributed to a lack of teacher content knowledge. Supporting this, evidence shows that large proportions of teachers in Kenya and Togo could not accurately correct at least 80% of student answers on a fourth-grade mathematics test, revealing an inability to evaluate student learning or guide them towards improvement (Brunetti et al., 2021).

Even when teachers have mastered the content, central instructional design decisions or differing teacher incentives may lead them to focus on higher-performing students. For example, teachers may prioritise maintaining instructional flow over supporting struggling students, or they may push through the curriculum without addressing areas where students need more help. Such approaches are often at odds with the strategies students need for success, and can contribute to student dropout (World Bank, 2018). To explore this issue further, various studies have assessed teachers' pedagogical skills. The World Bank's Service Delivery Indicators report found that the average teacher in Indonesia scored only 25% on a pedagogy assessment in 2019 (World Bank, 2020), while in Madagascar in 2014, the average teacher scored just 23% (Wane and Rakotoarivony, 2017). In Pakistan, Primary school teachers assessed on several pedagogical skills, including lesson facilitation, checks for understanding, and fostering critical thinking using the TEACH tool, saw nearly two-thirds (63%) of teachers score between two and three out of five. The lowest scores were in the areas of fostering critical thinking, providing feedback, and promoting social and collaborative skills (Molina et al., 2020).

Box 5. Meeting Children Where They Are: Designing Curricula to Target Appropriate Learning Levels

Curricula play a crucial role in educational systems because they establish standardised content and instructional approaches on a system-wide scale. Ideally, curricula should align with the economic and developmental needs of students and the country. However, in many low- and middle-income countries, researchers have documented a discrepancy between students' actual performance and curricular expectations — resulting in "overambitious curricula" (Pritchett & Beatty, 2015). In other words, many countries have national curricula that fail to focus on key fundamental skills, such as foundational literacy and numeracy (FLN), and instead expect students to grow at a much faster rate than what is feasible for the typical student's preliminary learning levels. 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, the consequences of poorly structured curricula that drive low foundational literacy and numeracy 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 when compared to their peers (World Bank, 2017). 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 low- and middle-income countries can bridge the gap between students' knowledge and policymakers' educational goals and lead to improved learning outcomes and increased regional economic productivity.

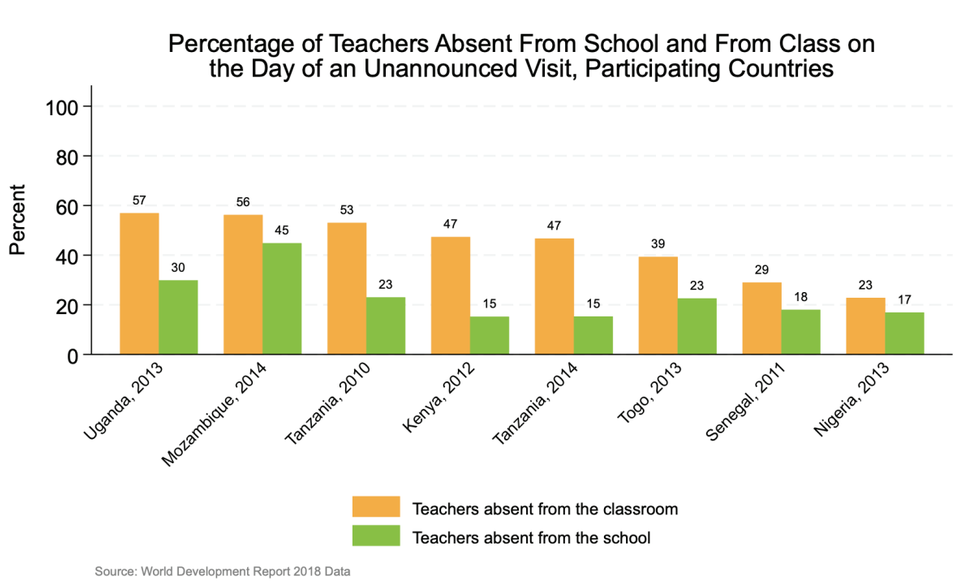
Curricular changes which increase focus on FLN — either through stronger pedagogy or more instructional time — have been shown to assist low-performing students in achieving national standards. For example, a study in India implemented a curriculum that was better suited to the median student's level with scientifically tested learning materials and accessible technology, which resulted in increased achievement in Maths and Hindi after just 4.5 months (Muralidharan et al., 2019). In Tanzania, targeted restructuring of early elementary curriculum to better suit the median student's performance was found to increase all participating students' proficiency in literacy and numeracy in grades 1 and 2. Students were twice as likely to reach minimum proficiency in grade 2 maths and significantly improved their language proficiency when compared to their peers 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 nation. Bringing instruction closer to the average student's levels led to widespread benefits, as the median student in many low- and middle-income countries tends to have similar outcomes to the lowest performing students. 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 in schools or additional classroom resources. Because curricula can be restructured and implemented on a system-wide scale at minimal cost, curricular reforms can yield high returns on learning outcomes in LMIC.

To effectively develop and implement high-quality curricula, data collection and effective educational pedagogy must be incorporated. Accurate and regular data collection on student performance is crucial for tailoring the curriculum to the needs of the student population. Analysing student performance throughout the academic year enables policymakers to identify areas where students are struggling and allocate more attention accordingly. In a curriculum reform in Costa Rica (Rodriguez-Segura, 2020), the lack of monitoring teaching methods and reliance on end-of-year results resulted in unintended consequences, such as long-term grade repetition and insufficient improvement in reading skills. However, when curriculum reforms are aligned with the median student'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, leading to improved learning outcomes without requiring high-cost measures, such as additional teachers or instructional time. By prioritising mastery of essential pre-skills in curricula before introducing new content, governments can significantly enhance the likelihood of meaningful learning outcomes for both whole classes and individual students.

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 delivery of the lesson with students' ability to achieve mastery of foundational concepts.

Strong governance is essential for encouraging teacher professionalism and accountability

Regardless of whether teachers possess ideal levels of content knowledge and pedagogical skills, it is essential that they uphold professionalism and accountability if they are to be effective. For this to occur, they must be supported by effective governance administered by informed policymakers. However, evaluative reports suggest that these vital elements are not always in place. Across eight African nations studied between 2010 and 2014, for instance, teachers were frequently absent from their classrooms or the school itself. In Mozambique, Uganda, and Tanzania, teacher absenteeism rates were close to or exceeded 50% (World Bank, 2018). Absenteeism on this scale 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 when present teachers interrupt their classes to check on other classrooms left unsupervised due to absenteeism and a lack of substitute coverage (Bashir et al., 2018; World Bank, 2018). Teachers who are required to integrate these unattended students into their own class are forced to dilute the benefits of ability-grouping and disrupt the appropriate scope and sequence of academic content by delivering it to students for whom it was not intended.



Source: World Development Report 2018 Data

Effective school-monitoring practices are essential to address high rates of absenteeism across LMIC, but they are not always utilised to ensure consistent teacher attendance. In Tanzania, for instance, only 30% of schools reported that recent visits from Ministry of Education officials were related to teaching and learning. In a sample of public schools in India, no teachers with high absenteeism rates were dismissed by principals during their tenure (Mbiti, 2016). Additionally, UNICEF's Time to Teach study found that in several West and Central African countries, school leaders refrained from sanctioning frequent absenteeism due to uncertainty about the education system's hierarchy or doubts that corrective action would follow (Karamperidou et al., 2020).

Regular observation by school leaders and the introduction of programmes that tie professional benefits for teachers directly to academically constructive behaviours can lead to reduced absenteeism and improved classroom engagement, which naturally benefits students. For instance, a study of public schools in India showed a 25% reduction in overall absences and a 40% reduction in unauthorised absences when regular school inspections were conducted (Muralidharan et al., 2017). In another case, financial incentives that required teachers in India to take time-stamped photos with their class at the beginning and end of the school day led to better teacher attendance and, consequently, improved learning outcomes (Mbiti, 2016). Such initiatives not only enhance student learning gains but also establish professional expectations that can positively influence future generations of teachers.

However, the issue of teacher shortages extends beyond absenteeism, particularly in regions with daunting student-teacher ratios, such as South Asia, the Middle East, and Africa, where these ratios range from 35:1 to 90:1 (World Bank, 2018). This imbalance often forces teachers to focus more on classroom management than instruction, detracting from student achievement (Molina et al., 2020). Yet, efforts to reduce class sizes by hiring more teachers do not always lead to better outcomes. In western Kenya, for example, increasing the number of teachers did not improve performance. Instead, the additional staff reduced teachers' sense of urgency and responsibility, leading to a diffusion of accountability and a shift in focus to personal priorities, such as securing jobs for relatives (Mbiti, 2016). This example highlights the need for regular teacher observation and constructive coaching to accompany staffing increases, ensuring that expanded capacity translates into better instructional quality.

To optimise student learning, it is crucial that teachers be adequately supported by their education systems, and this support should include relevant, consistent in-service training. However, this vital support for professional performance is often lacking (World Bank, 2018). According to UNESCO's 2017 data, between one-third and over half of Primary school teachers in 21 countries are not adequately trained, and the quality of training varies across these nations (Montoya, 2019). Additionally, many teachers face heavy workloads that include administrative tasks unrelated to instruction, as well as a shortage of teaching and learning materials. Professional development for non-teaching education personnel is also essential, enabling them to better manage school-wide responsibilities and provide coaching to teachers. The use of structured pedagogy can further alleviate the burden on teachers who lack the time or resources to design effective lesson plans. Through increased training and support, teachers can be better positioned to meet professional standards.

Effective policymaking starts with reliable data

The coordinated, effective action of all stakeholders in an education system is essential for fostering student success – and lack thereof can undermine that success. The latter is especially a risk when policymakers' decisions do not properly leverage all components of the education system towards achieving a clear objective of enhanced student learning. Yet, policymakers seeking to enact change for learning-deprived schools can be inhibited or misled by an absence of data. Without accurate information about the state of learning across their education systems, policymakers lack the context with which to make viable recommendations. This insufficiency of actionable data is most common in the parts of the world where such data are needed most. World Bank research has demonstrated that LMIC, which represent the majority of the global population, have historically lacked assessment results that reliably compare learning outcomes on an international scale – and it is these countries that 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 begin with the system-wide collection of robust, regular measurements on the state of learning.

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Importantly, a single assessment or statistic does not paint the full picture; in order to accurately gauge the health of an education system, policymakers must have access to multiple cuts of data, and be equipped to consider data from multiple angles. For example, if students who struggled on one assessment withdrew from school in higher proportions than mid- to high-performing students, subsequent assessments would present a seemingly more favourable picture on average, even though learning levels will not in fact have improved (World Bank, 2018). Without additional data focusing on the participation and performance of these struggling students, policymakers would be misled – even when lack of measurement is not an issue.

Just as policymakers can benefit from reliable data on learning levels, education systems can benefit from fostering a culture of data usage at all levels. Teachers who regularly conduct formative assessments in the classroom will be able to identify students needing extra support, and provide differentiated instruction based on individual students' levels of preparation. School leaders and regional officials who access data from state or national assessments – and view breakdowns by classroom, school, or regional subdivision – will be able to identify teachers needing additional coaching and schools needing extra support. Nations participating in international large-scale assessments (ILSAs), which evaluate the effectiveness of education systems across countries and over time (World Bank, 2018; Rocher and Hastedt, 2020), will be able to gauge their own progress against that of their peers. The integrated information from these multiple layers of data sources will inform the broad reforms implemented by education leaders, which will in turn guide the day-to-day instruction in classrooms.

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

There is potential for substantial economic gains from thoughtful, increased investment in education

Students with strong learning outcomes are more likely to achieve higher educational attainment and are subsequently more productive and fulfilled in the labour market. For instance, research by the World Bank in 2018, based on observations in 139 countries, found a 9% average increase in wages for every additional year of schooling (Patrinos and Psacharopoulos, 2018). The converse also holds true; students currently deprived of learning stand to lose a collective $10 trillion in potential labour earnings over their working lives, which will have broader detrimental effects on the economies where these former students live and work. These foregone earnings are equivalent to one-tenth of global GDP and are twice the global annual public expenditure on Primary and Secondary education (Azevedo, 2018). Moreover, comprehensive research shows that deficits in student performance could lead to a loss of $700 trillion from the global economy by 2100 (Gust et al., 2022). The failure of education systems to meet the needs of the global population could lead to large financial losses, not only by impeding individual students' chances for personal prosperity but also by reducing potential future investments in education for subsequent generations.

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 student performance, which will in turn contribute to student 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.

Supporting cognitive development in childhood is crucial for ensuring a solid knowledge base in adulthood and enhancing pedagogy in classrooms

Missed learning opportunities early in life can have a stunting effect on students' learning trajectories as they advance through their education. Although the brain continues to adapt and foster learning throughout life, it operates most effectively when provided with a strong foundation during childhood upon which to build increasingly complex skills. In other words, students who lack mastery of fundamental content from the early grades are at greater risk of slower progress due to the cumulative nature of learning, which is particularly significant in a finite formal education period (World Bank, 2018; Eble and Escueta, 2022). The negative impact of early learning deficits is compounded by the fact that the synapses responsible for sensory pathways, language comprehension, and higher cognitive functions gradually plateau as children approach early adulthood. Therefore, a robust skills base is essential for pursuing an increasingly comprehensive education that adequately prepares graduates for societal participation (World Bank, 2018).

Further evidence supports the notion that foundational skills are pivotal for academic success. Observations conducted by researchers in high-performing classrooms reveal that foundational skills should be viewed as stepping stones to more advanced knowledge (Hwa and Duong, 2021). Mastery of fundamental concepts enables teachers to connect new ideas to previously learned material, moving beyond rote memorisation to more meaningful practice. This approach enhances students' ability to acquire and retain a broader scope of knowledge throughout their education. However, many curricula in LMIC still do not prioritise mastery of foundational literacy and numeracy, which ultimately hinders students' progress in subsequent stages of instruction.

Conversely, students who engage with and apply foundational skills are better equipped to develop metacognitive thinking from an early age. Those encouraged by their teachers to analyse their own learning processes tend to exhibit better performance and greater interest in learning (Hwa and Duong, 2021). Thus, fostering cognitive development through a learning-centric environment has cumulative benefits, enhancing both teaching practices and student agency. This, in turn, leads to more effective classrooms and improved educational outcomes.

Elevating education quality standards drastically improves educational equity

It is often the case, across LMIC, that students 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 students from all wealth groups (DHS, 2014, 2015-16; Spaull and Kotze, 2015). Research indicates that improving student mastery of foundational skills in an education system, regardless of the variety of socioeconomic backgrounds of the students comprising it, narrows gaps in academic performance — the very gaps that have been attributable to differences in student background — by providing the appropriate substructure students need before becoming exposed to more advanced concepts (Crouch et al., 2021; Asim, 2020). The implication of a narrowing learning divide, furthermore, is that a greater number of students 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, students' 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 students, and therefore promotes the upward mobility of all citizens in a society.

Education systems must be improved holistically

Optimising investments in education requires aligning entire education systems towards the common goal of enhancing learning in foundational skills and beyond. Education systems consist of many components — such as teachers, students, school infrastructure, and school leaders — and reform initiatives often target improving the quality or performance of individual components to mirror the characteristics of high-functioning education systems (Pritchett, 2013; Spivack, 2021). However, such approaches frequently overlook a crucial aspect: the interactions among these components. These relationships not only define but also reinforce the objectives of the entire education system (Spivack, 2021).

When the goals of one component are misaligned with the overall objectives of the system or when no clear objective is present, the quality of education and learning outcomes are compromised (Kaffenberger, 2021). It is not enough to adjust individual components; the processes through which they support or hinder each other must also be evaluated and refined to enhance their effectiveness in promoting meaningful learning.

In recent decades, global education systems have successfully focused on making schooling more accessible, thereby increasing enrolment and attendance (Spivack, 2021). To address the pressing need to improve student learning levels — essential for maintaining high enrolment and attainment rates and for enabling students to translate academic benefits into their future lives — education systems must be similarly aligned with comprehensive accountability and unified coherence. Therefore, any new intervention that countries may consider, particularly large investments, must ensure that all components, including both new and existing resources, work cohesively towards the ultimate goal of stronger learning outcomes that enable students to lead fulfilling and productive lives in the future.

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