Funda Wande Eastern Cape Evaluation

BASELINE REPORT

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SALDRU
Southern Africa Labour and
Development Research Unit

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Contents

ACRONYMS

CAPS	Curriculum Assessment Policy Statements (CAPS)
CVCV	Consonant-vowel-consonant-vowel
DBE	Department of Basic Education
DHET	Department of Higher Education and Training
ECDoE	Eastern Cape Department of Education
EGMA	Early Grade Mathematics Assessment
EGRA	Early Grade Reading Assessment
EGRS	Early Grade Reading Study
HOD	Head of Department
ICC	Intra-Cluster Correlation
IRR	Inter-Rater Reliability
LOLT	Language of Learning and Teaching
LTSM	Learning and Teaching Support Materials
MDES	Minimum Detectable Effect Size
PIRLS	Progress in International Reading Literacy Study
RAN	Rapid Automatized Naming
RCT	Randomized Control Trial
SALDRU	Southern Africa Labour and Development Research Unit
TIMMS	Trends in International Mathematics and Science Study
UCT	University of Cape Town

1. Introduction

INTRODUCTION

Funda Wande is a not-for-profit organization that aims to ensure that all learners in South Africa can read for meaning and calculate with confidence, in their home language by the age of 10. They develop video and print materials to equip teachers on how to teach literacy and numeracy in the Foundation Phase. Partnering with the Eastern Cape, Limpopo and Western Cape Departments of Education, Funda Wande is implementing a series of interventions over the next three years (2021-2023). SALDRU at the University of Cape Town has been tasked with conducting external impact evaluations of these interventions. The primary aim of the evaluations are to assess the causal impact of the Funda Wande and Bala Wande interventions on foundation phase learners' ability to read with meaning and calculate with confidence. A key purpose of the evaluations is to also compare the efficacy and cost-effectiveness of variations in the package of support both within and between provinces.

This report describes the evaluation design and baseline results for the Eastern Cape evaluation.

2. Evolution of Funda Wande

EVOLUTION OF FUNDA WANDE

FUNDA WANDE

Recognizing the limited opportunities for South African teachers to acquire specialized knowledge in teaching reading, particularly in African Languages, Funda Wande was established to provide in-service support for teaching reading for meaning in home languages. Funda Wande develops home language text resources for learners and teachers, curriculum aligned teacher guides with lesson plans and learner activity booklets, videos, blended pedagogic resources for teachers, and an NQF-6 level DHET-accredited Advanced Certificate in Foundation Phase Literacy Teaching offered at Rhodes University. Building on lessons learnt and promising insights from previous interventions and research e.g. the Department of Basic Education's (DBE) Early Grade Reading Studies (EGRS). Funda Wande also developed an in-classroom coaching support model to accompany their course and materials.

Funda Wande was invited by the Eastern Cape Department of Education to pilot their programme in primary schools in the province for a four-year period (2019 to 2022). SALDRU at the University of Cape Town (UCT) was charged with conducting an impact evaluation of the pilot programme with the primary aim to assess the causal impact of Funda Wande coaching on foundation phase learners' ability to read with meaning.. The impact evaluation uses a randomized control trial with schools randomized into one of two arms – Funda Wande and control. The 59 evaluation schools were selected from urban and peri-urban areas in three education districts in the Eastern Cape (namely Buffalo City, Nelson Mandela Bay, and Sarah Baartman). All schools in the evaluation are no fee, quintile three public schools with an isiXhosa language of learning and teaching. Randomly selected learners in grades 1 and 2 were assessed across four waves at the beginning of the 2019 school year before the programme began; in the fourth term of 2019; the first term of 2021; and again in the third term of 2021. The results for the first year of the programme indicated that Funda Wande is effective in improving grade 1 and 2 learners isiXhosa home language reading outcomes, with positive effects across all sub-domains of reading proficiency that could be reliably measured.

BALA WANDE

During the course of 2019, Funda Wande met with the 29 School Management Teams involved in the intervention as well as the ECDoE district officials in Sarah Baartman, Nelson Mandela Bay and Buffalo City. One of the points that came out of those interactions was that teachers, HODs and district officials all requested an extension of the Funda Wande programme to provide support for grade 1-3 mathematics.

Given that Foundation Phase teachers are not subject-specific teachers (i.e. all teachers teach all subjects in grade R-3), it is only logical that an intervention should address both literacy and numeracy. Workbooks or lesson plans, and coaching support are likely to be necessary for both mathematics and literacy. The combination has the added advantage of not confusing teachers by having two different pedagogical approaches and being able to provide an integrated timetable and program. There are also many overlaps between literacy and mathematics in grades 1-3. For example, the vocabulary needed to understand mathematics (more, less, bigger, smaller, length, width etc.) needs to be reinforced in literacy lessons and not only used when doing mathematics.

In 2020, the scope of the Eastern Cape intervention was expanded to include a mathematics component for grade 1 learners. *Bala Wande: Calculating with Confidence* is headed up by Dr Ingrid Sapire (Wits) who was also appointed by the Minister of Basic Education Ms Angie Motshekga to be the Chairperson of the Ministerial Task Team to develop the Framework for Teaching Mathematics for understanding.

3. Funda Wande and Bala Wande Interventions and Evaluations (2021-2023)

FUNDA WANDE AND BALA WANDE INTERVENTIONS AND EVALUATIONS (2021-2023)

The promising early results from the first Funda Wande evaluation add to the growing body of evidence that makes a strong case for the complementary role of material provision, a structured sequence of lessons, alignment around some central curriculum, and supporting teachers in "learning by doing" through teacher professional development support (see Piper et al., 2014, 2018 for Kenya; Kerwin and Thornton; 2019 for Uganda, Cilliers et al., 2019 for South Africa). However, many questions that remain are related to implementing a version of these programmes at scale: 1) will they work in different contexts 2) what role do the individual inputs and combinations play in driving programme impacts, 3) how cost effective and scalable are different modalities of the intervention and 4) how would programme costs and benefits change if it were implemented at scale within a national or provincial level public education system.

Partnering with the Eastern Cape, Limpopo and Western Cape Departments of Education, Funda Wande is implementing a new series of interventions and accompanying evaluations that seek to begin answering these questions. Evaluating across different provinces and languages will generate insights into the generalizability or transferability of results to different contexts. There will be variations in the package of support both within and between provinces which will allow us to identify the key drivers of programme impact and to compare the efficacy and cost-effectiveness of different modalities.

Following on from the first pilot in the Eastern Cape, Funda Wande is implementing a series of new interventions over the next three years (2021-2023) across three provinces. All interventions are built around the Funda Wande and Bala Wande learner and teacher support materials (LTSM). The most basic intervention involves only the LTSM while the others provide different types of accompanying support; namely coaches, teacher assistants and subject advisors.

Table 1. Funda Wande and Bala Wande interventions 2021 to 2023

Details of the intervention								Evaluation design
Province	Districts	Language	Intervention	Schools	2021	2022	2023	
Limpopo	Capricorn North Capricorn South	Sepedi	LTSM only; LTSM & teacher assistants	40 LTSM only 40 LTSM & teacher assistants 40 control	Grade R	Grade R	Grade R	RCT
					Grade 1	Grade 1	Grade 1	
						Grade 2	Grade 2	
							Grade 3	
Eastern Cape	Nelson Mandela Bay Sarah Baartman Buffalo City	isiXhosa	LTSM & coaches	29 LTSM & coaches 28 control	Grade 1	Grade 1	Grade 1	RCT
						Grade 2	Grade 2	
							Grade 3	
Western Cape	7 of 8 districts	Afrikaans	LTSM & subject advisors	50 LTSM & subject advisors 50 control		Grade 1	Grade 1	Statistical matching
							Grade 2	

Table 1 summarises the range of interventions by location, support package, number of schools, progression of roll-out across grades and the evaluation method used. The specifics of each of the interventions are described in detail below. We begin with the LTSM common to all interventions and then describe the package of support specific to each province.

Learner and Teacher Support Materials

The evidence emerging from the EGRS and other large-scale literacy interventions show that structured materials like lesson plans and graded readers work better than simply providing more general resources like story books or libraries. Indeed, the more targeted, detailed, and levelled materials given to teachers and learners, the more likely they are to be useful. The Funda Wande and Bala Wande materials have been rigorously developed over two years with inputs from academics from South African universities, literacy practitioners, provincial curriculum officials and building on the strengths of previous programmes. Keeping in

mind the need to improve the content knowledge and pedagogical skills of teachers while providing them with high-quality supporting materials, the team developed two comprehensive workbook series, Reading For Meaning and Calculating With Confidence. A key requirement in the design process was to provide unified frameworks for teaching literacy and numeracy in the Foundation Phase. All literacy materials are aligned to the DBE CAPS curriculum and guides while the numeracy materials are aligned to the new DBE Mathematics Framework.

The LTSM comprise (1) activity workbooks for each learner, (2) teacher guides aligned to the learner workbooks that explain to the teacher what they need to teach and how and (3) classroom materials including anthologies of graded readers, posters, phonics flashcards for literacy and manipulatives such as Base-Ten-Kits, Dienes' Blocks, models of shapes and measuring instruments for numeracy. All three components are perfectly aligned so that teachers can seamlessly move between the different materials. A series of videos aligned to the teacher guide provides a visual teaching experience to enhance understanding and demonstrate the use of techniques in an authentic classroom environment. These videos are freely available on YouTube and on the Funda Wande website.

Eastern Cape

Building on the promising early results for literacy, the existing coaches in the Eastern Cape will use the expanded set of LTSM to support foundation phase teachers in both literacy and numeracy. These expert coaches are experienced foundation-phase educators and have been working in the intervention schools since 2019. The coaches observe teachers in their classrooms, provide targeted advice on how to improve their practice, as well as provide model lessons with their students. They also conduct afternoon group training sessions for all Foundation Phase teachers at the school. Coaches visit each school an average of three times a month. This is in addition to the termly training that Funda Wande provides to teachers.

The Funda Wande pilot in the Eastern Cape is relatively resource intensive, both in terms of financial resources and the skills required to be able to provide on-site coaching for teachers. The interventions in Limpopo and the Western Cape aim to explore whether more scalable and sustainable modalities of implementation are also effective in shifting literacy and numeracy outcomes in the early grades.

Limpopo

The Limpopo intervention comprises two different packages of support. All intervention schools will receive the basic package of LTSM together with the teacher, HOD and Subject Advisor training[1]. Half of the intervention schools receive one teacher assistant per teacher to provide support with the use of the LTSM. The role of the teacher assistants is to help with classroom management and to increase the frequency of small group teaching and one-on-one teaching. The teacher assistants visit schools daily and remain with their teacher for the year. The other half of schools do not receive additional support on top of the LTSM and training.

Western Cape

The partnership with the Western Cape Department of Education provides an opportunity to study model scalability through existing government systems. Over a four-year period, the LTSM will be incrementally rolled-out to all Afrikaans LOLT schools in the province. Funda Wande will support the provincial education department in their implementation of the programme using a gradual release model of support with the aim of strengthening the internal capacity of the system. Funda Wande will be responsible for an initial pilot of 50 schools before roll-out commences in 2022. A modified cascade model will be used whereby subject advisors are trained and then supported in training HODs and teachers in the first year. In each new year subject advisors are trained in a new grade (for a maximum of three years and three grades) but in year two and following they must train teachers and HODs with less and less support from Funda Wande. The Western Cape intervention does not include either coaches or teacher assistants on top of the LTSM and training.

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1   Subject Advisor training in Limpopo took the form of the NQF-6 level DHET-accredited Advanced Certificate in Foundation Phase Literacy Teaching offered at Rhodes University

EVALUATION STUDY DESIGN AND METHODS

In Limpopo and the Eastern Cape, schools were randomly selected and assigned to either a control or treatment arm. The evaluation method in these provinces is a Randomised Controlled Trial (RCT). The main advantage of a randomized design is that it minimizes the potential for selection bias- that is, the possibility that observed differences in reading and numeracy outcomes between the treatment and control groups are due not to the impact of the project, but to other systematic differences between the two groups that the evaluation is not able to account for. Although randomization is an effective tool to rule out selection bias, non-randomized studies can be used in contexts where randomized evaluations are not feasible. Such is the case in the Western Cape, where the Department of Education selected schools for the intervention. As a result, in order to obtain causal estimates, the Western Cape evaluation will use a statistical matching method. This method matches treatment learners (schools) to control learners (schools) based on a range of observable variables including baseline literacy and numeracy skills.

The primary aim of the evaluations is to assess whether the Funda Wande and Bala Wande materials are effective in moving schools towards the programme's stated goal of all learners reading for meaning and calculating with confidence by the end of grade 3. However, a key focus of these evaluations is also to compare the efficacy and cost-effectiveness of the various modalities of support, both within and between provinces. The evaluation in the Eastern Cape will provide evidence of whether a model shown to improve early literacy can also be effective in the mathematics space. The coaching model is relatively resource intensive and the interventions in Limpopo and the Western Cape provide an opportunity to test whether more scalable and sustainable models can be effective. The evaluation of the teacher assistant programme in Limpopo will be able to show whether unemployed youth with at least matric can be used productively to improve learning outcomes when teachers are given a structured learning program. The partnership with the Western Cape Department of Education provides an opportunity to study model scalability through existing government systems.

A secondary aim of the evaluations is to contribute to ongoing research on early literacy and numeracy in South Africa. The longitudinal data collected through these studies will allow for the analysis of individual learner trajectories in both 'business as usual' and intervention environments.

4. Eastern Cape Evaluation Baseline

The Eastern Cape impact evaluation uses a RCT with schools randomized into one of two arms – Funda Wande/Bala Wande and control – for a three-year period. Figure 1 provides a graphic representation of the RCT design. The quantitative data from the RCT will be complemented with qualitative data to generate insights into potential mediators, moderators and underlying mechanisms at play. Qualitative data will include classroom observations, teacher tasks and key informant interviews. Monitoring data collected by Funda Wande will also be used to examine the extent to which all treatments achieve their intended inputs, activities and outputs. Detailed costing data will be provided by Funda Wande to measure the cost-effectiveness of each of the interventions.

The Eastern Cape data will be collected in three rounds: a baseline prior to programme implementation (early 2021), a midline near the end of 2021 and an endline at the end of 2022. Learners randomly selected at baseline will be followed in a longitudinal panel for the duration of the study. We will administer literacy and numeracy assessments to these same individual learners at multiple time points. This will enable us to measure the causal impact of the interventions on the development of learners' literacy and numeracy skills through the foundation phase. A key advantage of a learner-level panel is that it allows us to control for learner-level variation and therefore to more precisely measure intervention effects. A learner-level panel also allows us to explore whether the impact of the programme differs by baseline literacy and numeracy skill.

Figure 1. Funda Wande and Bala Wande Eastern Cape Intervention Impact Evaluation design
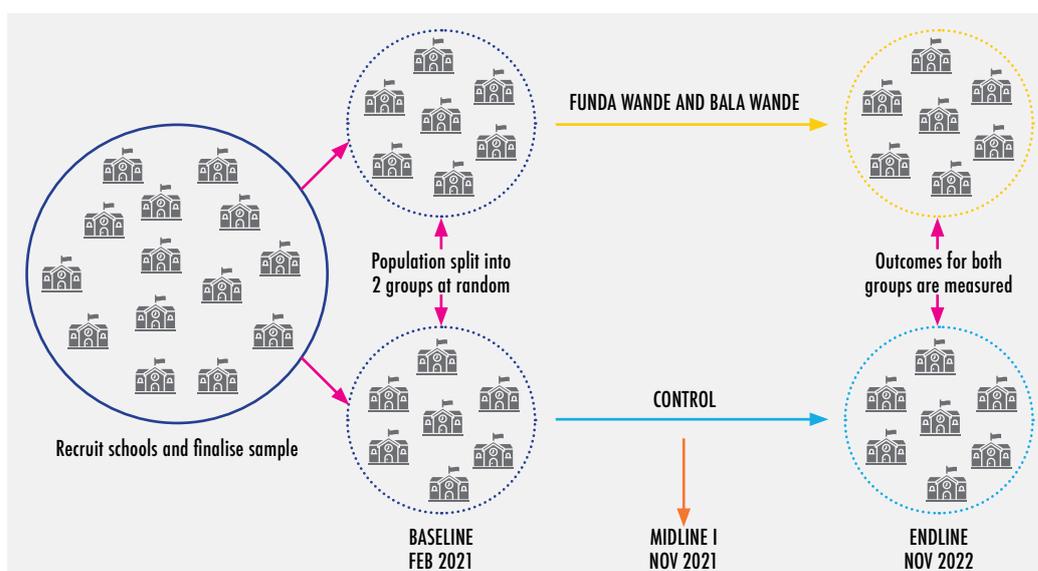
RECRUITMENT AND RANDOMIZATION OF SCHOOLS

Working with ECDoE, Funda Wande invited schools from the three urban and peri-urban districts in the Eastern Cape to apply to be part of the programme. To be eligible schools needed to be no-fee, public primary or -combined schools, with no other major literacy intervention ongoing and an isiXhosa language of learning and teaching (LOLT). Funda Wande further excluded schools with chronic management problems[2], severe overcrowding (class sizes of 50 plus) or fewer than 20 learners per grade[3].

Of the returned applications, 63 schools were selected as potentially eligible for the programme. Sixty of these schools were grouped into three geographic strata with the remaining three making up a replacement stratum. Within each group of 20 schools, we randomly assigned half of the schools to receive the Funda Wande program, with the other half serving as control schools. Post randomization, we discovered that the LOLT of two control schools was not isiXhosa throughout the Foundation Phase. We therefore dropped these schools and included the one control school from the replacement group. The final sample was comprised of 29 control schools and 30 treatment schools.

The first Funda Wande intervention and evaluation began in these schools at the beginning of 2019. As documented in detail in the 2019 Midline Fieldwork Report, during the second wave of data collection a treatment-assigned school refused to participate and was removed from the sample. The planned sample for this baseline therefore comprised 29 treatment and 29 control schools.

SELECTION OF LEARNERS

Within each school, we randomly selected 16 grade one learners. For this baseline, we wanted to ensure that learners had no previous exposure to Funda Wande or Bala Wande. We therefore excluded learners who were repeating grade 1 from the sample.

BASELINE INSTRUMENTS

The grade 1 assessments provide a baseline for the future evaluation of literacy and numeracy outcomes. Standard Early Grade Reading Assessments (EGRA) and Early Grade Mathematics Assessments (EGMA) are not appropriate for learners at this stage. The baseline literacy and numeracy assessment therefore drew on a range of instruments that are targeted at this level and include a range of pre-, emergent and early literacy and numeracy measures. The subtasks of the Grade 1 assessment are shown in Tables 2 and 3.

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2   As determined by the Subject Advisors who work within the schools.

3   If class sizes grew or shrank out of these bounds during the course of the intervention the classes and schools were retained. Hence, there were classes in 2021 which were larger than 50 learners.

Table 2. Reading skills and subtasks for Grade 1 assessment

Skill	Sub-task & Measurement
Productive listening comprehension	Number of questions answered correctly about a passage read aloud by the enumerator
Expressive vocabulary	Learner is asked to name items in shop and animals
Letter sound correspondence/knowledge	Number of letters sounds identified in 60 seconds
Phonemic awareness	Identify and manipulate phonemes (starting and ending sounds of words, segmenting words)

Table 3. Numeracy skills and subtasks for Grade 1 assessment

| Content Area	Topic	Specific Task
Numbers, operations and relationships		
	Number concept	Counts to 20
	Number concept	Counting on from a given number
	Number concept	Number recognition and order
	Number concept	Number ordering
	Number concept	Concrete counting
	Number concept	Compare collection of two objects
	Number concept	Show collections
	Solve problems	Addition and subtraction word sums
	Number sense	Ordinal numbers
Space and shape		
	2-D shapes	Shape identification
	Position	Position terminology
Data Handling		
	Sorts collection of objects	Sorting and classification
Patterns, functions and algebra		
	Geometric patterns	Pattern completion
Measurement		
	Measurement	Distance, length, volume

At the end of the assessment, we conducted a short survey with each selected learner to collect basic demographic and socioeconomic data.

The baseline fieldwork was conducted by iKapadata, the same company that conducted the fieldwork for the first Funda Wande evaluation. Fieldworker training took place in Gqeberha from Sunday, 21st February to Friday, 26th of February 2021 and was conducted by the Principal Investigator together with senior staff from iKapadata. Training consisted of five classroom days and one in field day with trainees assessing learners in a pilot school. The classroom days included lectures, role play, simulated tests and inter-rater reliability (IRR) exercises. At the pilot school, all assessors completed at least four learner assessments. A total of 25 enumerator recruits were trained, of which four were hired as supervisors and 16 as enumerators. Selections were made after the final day of training.

Figure 2. Trainees conducting literacy and numeracy assessments in the pilot school

All schools were contacted by telephone and emailed by iKapadata fieldwork staff members before the start of the actual data collection. The purpose of these calls was to reintroduce the study to the principal and relevant teachers, and to gain permission to conduct the study at the school. During the week of 9 February 2021, a team of 4 potential team leaders visited each school. The purpose of these visits was to drop-off information sheets and to confirm the date for the data collection visit. The information sheets were to be distributed to grade 1 teachers to send home with learners during the first week of the school term. The information sheets included an option for caregivers to withdraw their child from participation in the study.

Data collection was conducted by four teams consisting of four fieldworkers and one supervisor between 1st of March and 7th of April 2021. At each school, one grade 1 class was randomly selected and then 16 learners were randomly selected from within that class. Learners were considered ineligible if their caregiver did not consent to their inclusion in the study, if they were not isiXhosa home language speakers, if they were repeating grade 1, or if they had any cognitive impairments. In the event that there were fewer than 16 learners in the randomly selected class (due to COVID-19 related rotational time tabling), all learners
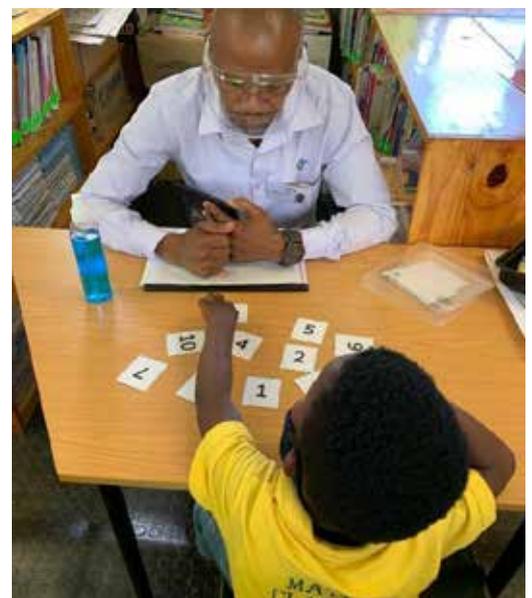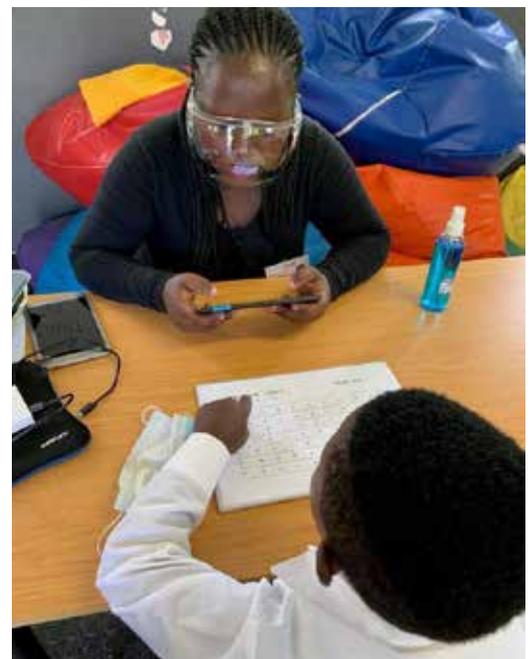
were assessed and the team moved to the next randomly selected grade 1 class until 16 learners had been assessed.

Despite considerable challenges due to COVID-19 and ongoing rotational timetabling, the fieldwork was successfully completed. However, one of the control schools in the sample refused to participate despite the best efforts of iKapadata and the Eastern Cape Funda Wande office. The final school sample for this baseline is shown by district in Table 4. Updated power calculations for this sample are shown in the appendix. The Eastern Cape study is powered to detect effects of 0.29 standard deviations or greater.

Table 4. School sample by district

	Control	Treatment	All
Nelson Mandela Bay	14	13	27
Gqeberha	11	10	21
Uitenhage	3	3	6
Sarah Baartman	7	6	13
Makhanda	4	4	8
Makhanda surrounds	3	2	5
Buffalo City	7	10	17
East London	4	5	9
King Williams Town	3	5	8
Total	28	29	57

BALANCE BETWEEN TREATMENT AND CONTROL

Baseline equivalence of the full sample was guaranteed through the random assignment of schools to treatment and control using statistical software. However, since randomization, two schools have withdrawn from the study. Additionally, while there is no reason to believe that have been systematic changes in the grade 1 learners attending each school in the two years since random assignment was completed, it is prudent to check for any imbalance. Appendix Table A2 presents summary statistics for a range of baseline assessment scores, observable learner characteristics and household assets separately by treatment status. Of the 41 variables in Table A2, there are four statistically significant differences between treatment and control (radio, computer, bicycle and microwave). This is within the range of what we would have expected given random sampling variation. There are no statistical differences in numeracy and literacy scores between treatment and control learners. We also follow the What Works Clearing House (2020) guidelines and examine effect sizes for evidence of imbalance. The differences between treatment and control on all variables are within the limits to satisfy baseline equivalence. This means that programme impacts can be reliably estimated.

5. Baseline Results

BASELINE RESULTS

Table 5 presents basic sample characteristics by district. The sample consists of 912 grade 1 learners, with roughly equal numbers of boys and girls. While almost all learners live with their mother, only 64% co-reside with their father. Learners' responses to a range of questions around household possessions highlight that many of these learners come from homes that are not optimally prepared to support the remote learning associated with school closures and rotational timetabling since the start of the COVID-19 pandemic. While almost all learners live in a household with television, 46% have no books other than school books to read at home and only 37% have a computer. On average, learners are fairly similar across the districts although they are around 10 percentage points less likely to live with their father and around 10 percentage points more likely to have books to read in the home in Buffalo City compared to the other districts.

Table 5. Grade 1 learner sample characteristics by district

	Nelson Mandela Bay	Sarah Baartman	Buffalo City	All
Female	48%	52%	50%	50%
Lives with mother	92%	93%	90%	92%
Lives with father	66%	67%	57%	64%
No books at home	48%	52%	38%	46%
Household has TV	94%	89%	89%	92%
Household has radio	67%	62%	55%	62%
Household has computer	37%	35%	37%	37%
Learners	432	208	272	912

Literacy

The aggregated results of the five emergent and early literacy tasks are presented in Table 6. The first column shows the percentage of learners who scored zero for the task. The second column gives the average score and, where appropriate, the final column presents this average score as a percentage. Each of the five tasks is discussed in detail below.

Table 6. Grade one literacy scores

	% of learners scoring zero	Average score	Maximum possible	% correct
Productive listening comprehension	12%	2.2	6	37%
Expressive vocabulary	3%	7.6	20	38%
Phonemic awareness	50%	1.5	10	15%
Letter sound knowledge	43%	4.8		
Rapid automatized naming	0%	38		

Productive Listening Comprehension

For the productive listening comprehension task, the enumerator read a short isiXhosa story to the learner twice and then asked six simple questions about the passage that they had read. Around one in ten learners (12%) were unable to answer any of the questions. On average, grade 1 learners could correctly answer 2.2 of the six questions. Learners found the one interpretive question much harder than the other literal questions. Only 3% of learners provided a correct answer to the interpretive question, in contrast to the range of 21% to 73% for the literal questions.

Expressive Vocabulary

The expressive vocabulary subtask asks learners to imagine they are going to a shop and then to name as many things that one can buy from a shop as they can think of. The assessor counts each unique appropriate response up to a limit of 10. The learner is then asked to name as many animals they can think of, again with a limit of 10. Twenty-three learners (3%) were unable to name any items. On average, grade 1 learners named 4 distinct items from a shop and 3 animals. The average score of 7.6 is 38% of the possible total of 20.

Phonemic Awareness

The phonemic awareness subtask asks learners to identify and manipulate phonemes. The task consists of 10 items beginning with identifying the starting sound of words and progressing to more challenging word segmentation tasks. Half of the grade 1 learners were unable to identify the start sound of simple consonant-vowel-consonant-vowel (CVCV) words. Learners who did not score zero, were able to correctly answer 3 of the 10 questions.

Letter Sounds

For this subtask, learners are given a sheet of letters and asked to sound out as many of the letters that they can in one minute. Around four in ten (43%) of grade 1 learners were unable to identify a single letter sound. Amongst those grade 1 learners who were able to correctly sound at least one letter, the average score was around 9 correct letters per minute. Accuracy was poor, with only 38% of attempted letters correct.

Rapid Automatized Naming

The Rapid Automatized Naming (RAN) task requires rapid naming of a series of six common objects presented multiple times in random order. In preparation for this subtask, enumerators confirmed that learners were familiar with and able to name the six common objects. Due to the familiarity of the stimuli, RAN should involve automatic processes. While there is contention over whether RAN measures phonological processing, orthographic processing or a more complex set of cognitive processes (Arnell et al. 2009), empirical evidence has found RAN to be predictive of later reading ability (Lervåg and Hulme (2009), Furnes and Samuelsson (2011) amongst others). Pre-literate children with naming speed deficits are at risk for later reading difficulties (see Dubeck et al. 2017 for a recent example from Malawi). On average, learners identified 38 objects per minute with an accuracy of 98%.

Numeracy

The numeracy assessment consisted of 13 tasks that covered all of the CAPS grade R content areas. Table 7 below shows the full list of items that make up those 13 tasks. The percent of learners correctly executing each item is shown in the final column. We discuss the results for each content area separately below.

Table 7. Grade one numeracy assessments

Numbers, operations and relationships			
	Number concept	Count to 20	50%
	Number concept	Count from 5 to 10	24%
	Number concept	Count from 9 to 14	18%
	Number concept	Orders number cards 1 to 10	35%
	Number concept	Identifies number 6	71%
	Number concept	Knows 5 comes before 6	13%
	Number concept	Identifies number 3	86%
	Number concept	Knows 4 comes after 3	65%
	Number concept	Counts all 20 counters	49%
	Number concept	Identifies pile with more counters	98%
	Number concept	Identifies pile with fewer counters	98%
	Number concept	Makes piles equal	35%
	Number concept	Shows 3 counters	84%
	Number concept	Shows 8 counters	68%
	Number concept	Shows 15 counters	35%
	Solve problems	Word sums addition combine (2+3)	29%
	Solve problems	Word sums subtraction change (8-2)	13%
	Solve problems	Words sums addition change (3+7)	15%
	Solve problems	Words sums subtraction compare (10-4)	1%
	Solve problems	Word sums addition compare (6+2)	2%
	Solve problems	Word sums missing part unknown (?-3=6)	2%
	Number sense	Identifies last child	61%
	Number sense	Identifies first child	59%
	Number sense	Identifies second child	53%
	Number sense	Identifies fifth child	23%
	Number sense	Identifies third child	34%
Patterns, functions and algebra			
	Geometric patterns	Identifies missing shape	51%
	Geometric patterns	Identifies missing shape	49%
	Geometric patterns	Identifies missing shape	54%
	Geometric patterns	Identifies missing shape	61%
	Geometric patterns	Identifies missing shape	57%
	Geometric patterns	Identifies missing shape	44%
	Geometric patterns	Identifies missing shape	45%
	Geometric patterns	Identifies missing shape	47%

Space and shape			
	2-D shapes	Identifies a triangle	66%
	2-D shapes	Identifies all triangles	46%
	2-D shapes	Identifies a circle	89%
	2-D shapes	Identifies all circles	77%
	2-D shapes	Identifies a square	52%
	2-D shapes	Identifies all squares	18%
	Position	Inside	97%
	Position	Behind	91%
	Position	In front	91%
	Position	Farthest	63%
Measurement			
	Length	Shortest	91%
	Volume	Highest volume	60%
Data Handling			
	Sorts collection of objects	Sorts by one criterion	55%
	Sorts collection of objects	Sorts by two criteria	6%
	Sorts collection of objects	Sorts by three criteria	0%

Numbers, operations and relationships

There were several tasks that assessed learners' ability to count. The first task asked learners how high they could count aloud, stopping learners at 20. While half of the grade 1 learners were able to count to 20, a quarter could not count up to 10. Learners struggled to count on from a particular number with only 24% and 18% of learners able to count from 5 to 10 and 9 to 14 respectively. Learners then moved on to concrete counting tasks. Just under half of the learners (49%) were able to count all 20 counters. While the vast majority (84%) could show three counters, only 35% of learners were able to show 15 counters. Given

two different quantity piles of counters, 35% of learners were able to make two piles equal. Nearly two-thirds (65%) of learners were unable to correctly order number cards from one to ten and while 65% knew that four came after three, only 13% knew that five came before six. The majority of learners could identify the children coming first, second and last in a race but most learners struggled with other positions such as third and fifth. Learners were asked a series of word problems involving addition and subtraction. Only one in three children were able to solve the simplest problem (an addition combine of 2 and 3) but very few were able to correctly answer any of the other items.

Patterns, Functions and Algebra

Learners were shown a series of geometric patterns made up of two items that differed in both shape and colour. In each pattern, one or two of the items was missing. The learner was asked which shape was the correct one to complete the pattern. On average, learners scored between 44% and 61% for these items. These scores being around 50% together with the low correlation of this item with the rest of the numeracy assessment, suggests that many learners were guessing. This pattern task will therefore be changed in further data collection rounds.

Shape and space

Learners were shown a card with shapes of various sizes and asked to identify all the triangles, circles and squares. Almost all (89%) learners were able to identify a circle while only 66% and 52% could identify at least one triangle and one square respectively. The percentage of learners able to identify all the instances of a particular shape was 77%, 46% and 18% for circles, triangles and squares respectively.

Learners found the tasks around positions easy with the vast majority being able to identify inside, behind and in front.

Measurement

The concepts of length and volume were assessed by asking learners to identify the shortest pencil in a picture and the box with the capacity to contain the most balls. Learners scored 91% and 60% for these tasks respectively.

Data handling

Learners were shown nine cards of three different shapes in three colours and three sizes. They were then asked to sort the cards. Just over half (55%) of learners were able to sort by either shape, colour or size. If they successfully sorted by one criterion, then they were asked whether they could sort the cards in a different way. Only 6% of learners were able to sort by a second criterion. These learners were then asked if they could sort by a third criterion. Only four learners were able to sort by all three attributes.
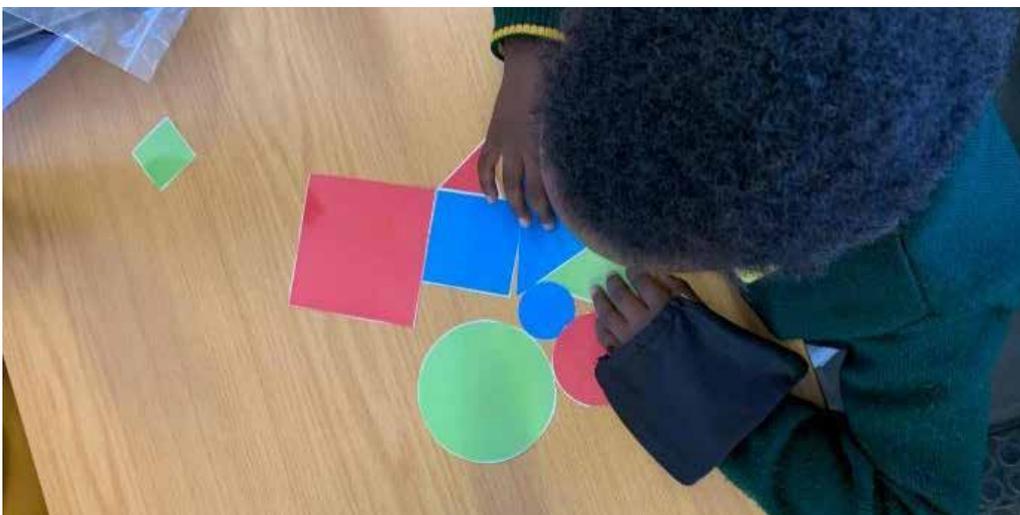
Floor and ceiling effects

In order to discriminate between learners at baseline and measure incremental progress at later evaluation points, assessment tasks should not have a substantial portion of learners scoring zero (floor effects) or full marks (ceiling effects). At the individual item level (Tables 6 and 7) there are several tasks that learners find particularly challenging and a few that almost every learner was able to do. For subsequent rounds of assessment in the Eastern Cape and other provinces, these items should be reconsidered for possible removal or replacement. For this baseline, our interest is more in the performance of the overall literacy and numeracy assessments rather than the individual items. We use Principal Components Analysis to reduce the data on all the EGRA sub-tasks to a single variable that captures most of the common variation among them. Figure 3 shows the distribution of this composite reading proficiency score expressed in standard deviations. The median is represented by the solid red line and the inter-quartile range (25th to 75th percentile) lies between the two dashed red lines. There is good variation between learners and no evidence of floor or ceiling effects for the composite literacy score.

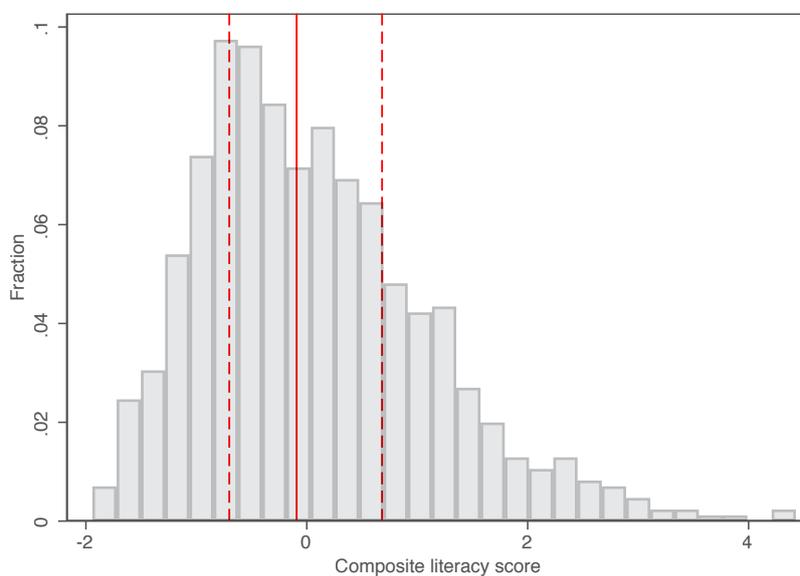**Figure 3. Distribution of composite literacy score**

Figure 4 shows the distribution of the overall numeracy score expressed as a percentage with all 13 tasks equally weighted. The overall distribution of the numeracy score is very satisfactory with good discrimination amongst learners and no evidence on floor or ceiling effects. The average grade 1 learner scored 48% and the middle 50 percent of the distribution lies between 34 and 62 percent.

Figure 4. Distribution of total numeracy score
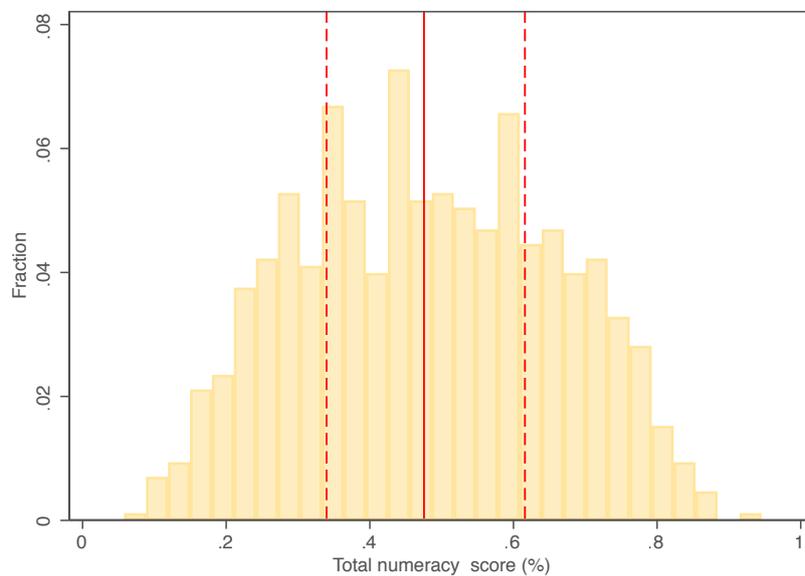
6. Conclusion

CONCLUSION

This report presents findings from the baseline data collection for the impact evaluation of the Funda Wande and Bala Wande workbooks intervention in the Eastern Cape. For both literacy and numeracy, we find that the majority of learners are starting grade 1 without a solid foundation in the skills covered by the CAPS grade R curriculum. To some extent this should not be surprising given the unprecedented disruptions to the 2020 school year when these learners would have been in grade R. Reports from grade 2 teachers in the same schools indicate that school was only open to the average grade 2 learner for around 40 percent of the days of a normal school year. The situation is likely to have been more severe for grade R learners. However, the results from this baseline are not that dissimilar to those for the 2019 grade 1 learners from the first Funda Wande evaluation which points to a lack of grade R curriculum coverage and mastery that pre-dates COVID-19.

From a technical and statistical perspective, the baseline data collection encountered no serious challenges. In terms of statistical power, the intra-school correlations are in line with those assumed in our power calculations. One school refused to participate during the fieldwork and while this has reduced the overall sample size, differences between the treatment and control group are within the limits for baseline equivalence and the minimum detectable effect size remained 0.29 standard deviations. As expected, we observed some floor effects but across the range of numeracy and literacy subtasks we have decent discrimination amongst learners.

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8. Appendix

APPENDIX

POWER CALCULATIONS

Within each of the 57 schools, we randomly selected 16 grade 1 learners for assessment. This sample size was determined through statistical power calculations. As with any quantitative analysis based on survey data, the statistical power of any sample design is determined by a mathematical calculation that depends on a number of factors. These include features of the study design, properties of the data and outcome variables, and the desired precision of the analysis. In practice, power calculations require choices and assumptions about a range of these parameters. We carry out the power calculations using the Optimal Design software package, which can perform these calculations under a variety of scenarios.

In our power calculations, we make the following assumptions about parameters:

i. α is the significance level of the test, or probability of Type I error. We use the standard value of 0.95.

ii. β is the power of test, where $(1-\beta)$ is the probability of Type II error. We use the standard value of 0.8.

iii. ρ is the intracluster correlation coefficient, or ICC. The ICC is a measure of the extent to which variation in outcomes is due to cluster-level factors as opposed to individual-level factors. In our case, the ICC reflects the extent to which differences in literacy and numeracy scores are due to differences between schools, rather than differences between individual students within a school. Based on data from this baseline, the first Funda Wande evaluation and other similar evaluations in South Africa, we assume that 10% of the variation in literacy and numeracy scores is due to schools.

iv. r^2 is the proportion of the variation in the outcome due to the covariates anticipated in the regression analysis. In our case, these covariates will include a range of individual characteristics, as well as the intertemporal correlation between outcomes values at baseline and follow up. For this parameter, we assume an approximate value of 0.3 based on data from the first Funda Wande evaluation.

v. attrition is assumed to be 8 percent across the sample. This is the equivalent to one school dropping out and an average attrition rate of 6.25 percent across the remaining schools. Our power calculations assume an average cluster size of 15 learners per school for 56 schools.

These parameters enable us to calculate the minimum detectable effect size (MDES). The MDES is the smallest impact of the programme on the outcome variable that the evaluation will be able to detect with the required power. The Eastern Cape study is powered to detect effect sizes of 0.29 standard deviations or greater.

Table A1. Percentiles, items attempted and accuracy of literacy and numeracy subtasks

	Mean	Std Dev.	Minimum	Percentile					Maximum	% scoring zero	% scoring 100%
				10th	25th	50th	75th	90th			
Letters (correct per minute)	4.84	8.46	0.00	0.00	0.00	1.35	6.00	14.0	84.00	43%	
RAN (correct per minute)	38.0	11.6	3.0	24.0	30.0	36.0	48.0	54.0	78.0	0%	
Phonemic awareness (%)	14.7%	18.3%	0.0%	0.0%	0.0%	0.0%	30.0%	40.0%	90.0%	50%	0%
Expressive vocab (%)	38.2%	18.9%	0.0%	15.0%	25.0%	35.0%	50.0%	65.0%	100.0%	3%	1%
Productive listening (%)	37.0%	23.1%	0.0%	0.0%	16.7%	33.3%	50.0%	66.7%	100.0%	12%	1%
Numeracy item 1 (%)	50.2%	50.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	100.0%	50%	50%
Numeracy item 2 (%)	20.6%	35.9%	0.0%	0.0%	0.0%	0.0%	50.0%	100.0%	100.0%	72%	14%
Numeracy item 3 (%)	35.3%	47.8%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	65%	35%
Numeracy item 4 (%)	58.4%	27.0%	0.0%	25.0%	50.0%	75.0%	75.0%	75.0%	100.0%	9%	8%
Numeracy item 5 (%)	48.8%	50.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	100.0%	51%	49%
Numeracy item 6 (%)	77.0%	18.6%	0.0%	66.7%	66.7%	66.7%	100.0%	100.0%	100.0%	1%	35%
Numeracy item 7 (%)	62.4%	34.5%	0.0%	0.0%	33.3%	66.7%	100.0%	100.0%	100.0%	13%	35%
Numeracy item 8 (%)	10.4%	16.3%	0.0%	0.0%	0.0%	0.0%	16.7%	33.3%	83.3%	63%	0%
Numeracy item 9 (%)	20.3%	20.2%	0.0%	0.0%	0.0%	33.3%	33.3%	33.3%	100.0%	45%	0%
Numeracy item 10 (%)	46.1%	34.5%	0.0%	0.0%	20.0%	40.0%	80.0%	100.0%	100.0%	21%	15%
Numeracy item 11 (%)	57.8%	27.3%	0.0%	16.7%	33.3%	66.7%	83.3%	100.0%	100.0%	5%	12%
Numeracy item 12 (%)	51.0%	17.9%	0.0%	25.0%	37.5%	50.0%	62.5%	75.0%	100.0%	1%	1%
Numeracy item 13 (%)	82.0%	19.0%	0.0%	50.0%	66.7%	83.3%	100.0%	100.0%	100.0%	0%	36%

Table A2. Baseline balance

	Treatment		Control		p-value	Pooled	Effect
	Mean	Std Dev.	Mean	Std Dev.		s.d.	size
Female	49.8%	50.1%	49.8%	50.1%	1.00	50.0%	0.00
Letter sound knowledge (per minute)	5.32	9.17	4.33	7.62	0.18	8.46	0.12
RAN (per minute)	37.4	11.5	38.7	11.7	0.19	11.6	0.11
Phonemic awareness (%)	16.0%	19.0%	13.4%	17.5%	0.16	18.3%	0.14
Expressive vocab (%)	39.1%	19.2%	37.2%	18.6%	0.25	18.9%	0.10
Productive listening (%)	38.6%	24.0%	35.3%	22.1%	0.14	23.1%	0.14
Numeracy item 1 (%)	49.8%	50.1%	50.7%	50.1%	0.85	50.0%	0.02
Numeracy item 2 (%)	20.4%	36.0%	20.9%	35.8%	0.87	35.9%	0.01
Numeracy item 3 (%)	36.2%	48.1%	34.4%	47.5%	0.66	47.8%	0.04
Numeracy item 4 (%)	58.6%	27.4%	58.3%	26.6%	0.88	27.0%	0.01
Numeracy item 5 (%)	48.5%	50.0%	49.1%	50.0%	0.88	50.0%	0.01
Numeracy item 6 (%)	76.2%	18.3%	77.8%	19.0%	0.30	18.6%	0.08
Numeracy item 7 (%)	61.9%	34.0%	62.9%	35.1%	0.79	34.5%	0.03
Numeracy item 8 (%)	10.5%	16.5%	10.3%	16.2%	0.94	16.3%	0.01
Numeracy item 9 (%)	18.9%	20.2%	21.7%	20.2%	0.11	20.2%	0.14
Numeracy item 10 (%)	45.7%	35.4%	46.5%	33.6%	0.82	34.5%	0.02
Numeracy item 11 (%)	56.3%	28.0%	59.4%	26.5%	0.08	27.3%	0.12
Numeracy item 12 (%)	51.3%	18.2%	50.7%	17.6%	0.63	17.9%	0.04
Numeracy item 13 (%)	81.0%	19.5%	83.0%	18.4%	0.17	19.0%	0.10
No books to read at home	47.0%	50.0%	44.3%	49.7%	0.56	49.8%	0.05
Lives with mother	90.7%	29.1%	92.4%	26.5%	0.42	27.8%	0.06
Lives with father	63.7%	48.1%	63.8%	48.1%	0.99	48.1%	0.00
Radio	65.7%	47.5%	58.5%	49.3%	0.03	48.5%	0.15
Cell phone	94.8%	22.2%	94.2%	23.4%	0.71	22.8%	0.03
Television	92.9%	25.7%	90.2%	29.8%	0.19	27.8%	0.10
Computer	40.7%	49.2%	32.3%	46.8%	0.01	48.2%	0.18
Fridge	92.2%	26.8%	90.0%	30.1%	0.25	28.5%	0.08
Bicycle	47.8%	50.0%	40.6%	49.2%	0.01	49.7%	0.15
Vehicle	56.3%	49.7%	57.4%	49.5%	0.79	49.6%	0.02
Washing machine	71.8%	45.1%	67.4%	46.9%	0.21	46.0%	0.09
Microwave	85.3%	35.4%	80.4%	39.8%	0.04	37.7%	0.13
Flush toilet	73.7%	44.1%	66.7%	47.2%	0.12	45.7%	0.15
Electricity	96.1%	19.3%	94.2%	23.4%	0.19	21.4%	0.09
Piped hot water inside house	40.7%	49.2%	38.6%	48.7%	0.61	48.9%	0.04
Observations	464		448				

Notes: Effect sizes are calculated as the difference in means between the treatment and control groups, divided by the pooled standard deviation for the variable. If the effect sizes are 0.05 or less in absolute value, the two groups are considered equivalent on that dimension. When effect sizes are in the range between 0.05 and 0.25, the baseline measures should be included as controls in the model estimating programme effects to satisfy equivalence. Variables for which such adjustments are required include 9 of the 18 sub-tasks, whether the learner co-resides with their mother and nine of the 12 household possessions reported by the learner. These variables are therefore added as controls to satisfy equivalence between the two groups, and not only to improve the precision of the estimates of programme impact. No effect size is greater than 0.25 in absolute value - the level at which the samples are considered to be not equivalent.