Literacy Boost Tigray, Ethiopia

Endline Evaluation Report

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Executive Summary

This report examines the results of a learner background survey and endline reading assessment conducted in June 2014. The survey and reading assessment covered 300 grade 3 learners throughout 15 schools in the Tigray Impact area of Ethiopia. The 15 schools have received Literacy Boost programs for the previous three years. Although this study serves as a follow-up endline to a baseline conducted in the same 15 schools in 2011, it presents data from a new sample of students taken from a different cohort than the students sampled in 2011.

The most common reading material in students' homes are newspapers, student texts and religious materials during the endline, and more children at the endline have storybooks, newspapers and religious books than the children in the baseline. During the endline 77% of students report seeing of their household members read in the past week, and 73% have someone to read for them at home, figures which have not significantly changed since baseline.

In terms of reading skills, students have mastered concepts about print and have nearly done so with most used words. Both scores have increased significantly since baseline to 97% correct and 93% correct, respectively. Although average scores in letter knowledge has increased significantly since baseline to 79%, students still need help with this skill, especially with letters : Y (ዬ/ye), V (ቨ/vi), P (ፖ/po), Ch (ዠ/zzu), F (ፊ/fi), and Dh (ጰ/pe). The proportion of readers has also significantly increased to 93%, and among these students fluency and accuracy scores have increased to 44 words per minute correct and 89%, respectively. However, students still need help with reading comprehension. Although average scores have increased to 63% question correct, still only 20% of students meet the ultimate target of being 'readers with comprehension.'

Equity regression analysis reveals that students who reported having previously participated in ECCD programs performed better on average than students who reported no participation in these programs. In terms of Literacy Boost community action participation, the children who were able to name their favorite book from the Book Bank have significantly higher scores in all outcomes except concepts about print. However, exposure to reading buddy, participation in reading camps and reading materials in home do not have a significant relationship with outcome variables. Finally, children who repeated scored lower on letter knowledge than those who had never repeated.

Given these results, this report makes the following recommendations:

- Literacy boost intervention have crucial impact on learning outcomes therefore it is recommended to scale up to regional as well as national level.

- Future Literacy Boost programming should focus on students' skill deficiencies such as letters Y (ዬ/ye), V (ቨ/vi), P (ፖ/po), Ch (ዠ/zzu), F (ፊ/fi), and Dh (ጰ/pe) and words similar to the most difficult most used words. Students who can read a degree of connected text should be given more opportunity to improve their speed and accuracy through activities such as Reading Camps and Reading Buddies. Finally, teachers and community

action facilitators should be given a variety of suggested fun activities to better engage children in reading comprehension practice.

- ❖ Grade repetition is a good targeting mechanism to prioritize students for remedial interventions.

- ❖ ECCD intervention is critical for students to achieve satisfactory learning outcomes. Therefore, it is recommended to strengthen the current zero class government started, and the findings presented in this report can be used as strong evidence for scaling up quality ECCD programming in Ethiopia.

- ❖ It is recommended to design strategy to improve home literacy environment. The students who still report no storybooks in the home will need alternate access to storybooks through initiatives such as Book Banks. Furthermore, the high literacy rates in endline.

I. Introduction

This report examines the results of a learner background survey and endline reading assessment conducted in June 2014. The survey and reading assessment covered 300 grade 3 learners throughout 15 schools in the Tigray Impact area of Ethiopia. The 15 schools have received Literacy Boost programs for the previous three years. Although this study serves as a follow-up endline to a baseline conducted in the same 15 schools in 2011, it presents data from a new sample of students taken from a different cohort than the students sampled in 2011.

The Literacy Boost program includes teacher training, community reading activities, and age-appropriate local language materials purchased from local bookshops to support emergent literacy skills among early-grade children. These skills include concepts about print, letter awareness, single word reading of most used words, reading fluency, reading accuracy, and reading comprehension. As part of Literacy Boost, learners are periodically assessed in each of these skills through an adaptable assessment tool to inform programming and estimate program impact. The data gathered from these schools is analyzed to present a snapshot of the emergent literacy skills of grade 3 learners in these schools and to inform the adaptation of Save the Children's (SC's) Literacy Boost program to this context.

The key research questions to be explored in this report include:

1. How comparable are learners in from the endline sample versus children in the same grade from the baseline sample (before the intervention of the Literacy Boost program) in terms of reading skills, background characteristics and home literacy environment?
2. What can the endline tell us about learners' emergent reading skills? What does this mean for continuing Literacy Boost programming?
3. How do learners' reading skills vary by student background, sex and home literacy environment? What does this mean for scaling up Literacy Boost's to all primary schools in the Region?
4. What can we estimate about the impact of the Literacy boost program?

To investigate these questions, this report will first describe the research methods used; including sampling, measurement, and analysis. Next, in order to see if groups are statistically similar, the comparability of baseline and endline students will be examined through t-tests. The comparability of baseline and endline learners' scores for each of the emergent literacy skills, exploring learners' strengths and weaknesses in each skill, will also be examined. The report will then examine what are the literacy skills that are already present in the sample, and what areas should Literacy Boost focus on. The report will then investigate student backgrounds examined through t-tests. Finally, the report will investigate any correlations with student background or home literacy practices and environment variables using regression analysis.

11. Methods

The sample for this end line evaluation encompasses 300 grade 3 learners, selected from 15 schools that received the Literacy Boost intervention for the previous three years.
These Literacy Boost schools have received all the components of LB program from Save the Children for three consecutive years starting from grade one to grade three.

At each of the Literacy Boost schools where data was collected, a proportional number (32%) children from grade 3 were sampled. If there was more than one section of grade three at a given school, every section was represented proportionally. As far as possible, females were equally represented in the sample. As a result, there are 158 boys and 142 (47%) girls in the sample.

The new samples include different children, and from a different cohort, than that sampled in the 2011 baseline, in which children were randomly sampled from grade 3. Also, during the 2011 baseline assessment there were five schools used as control group. However, the schools joined to the Literacy boost program soon after the program piloted in the 15 schools, and thus these schools could no longer serve as comparison schools by the time of the 2014 endline.

Measurement

For the student assessment, all learners in the sample were asked about their background characteristics (age, household possessions, household building materials, etc.). Learners also were asked about their family members and reading habits in their home (who they had seen reading in the week prior to the assessment, who had read to them etc). Table 1 below provides the full list of information collected from children.

Table 1: Literacy Boost Assessment Instruments

Student background	**Examples**
General	Sex, age, language spoken at home, work/chores
School-related	Repetition history
Socioeconomic status	Type of home, household size, household amenities/possessions
Home Literacy Environment	
Access to print	Materials present in home, types of materials
Reading activities at home	Presence and percentage of family members who children see read, and who engage in literacy activities with children
Reading Outcome	**Description**
Alphabet knowledge	Number of letters/sounds known of 31
Single word reading	Number of single words read correctly of 20
Fluency	Number of words in a short story read correctly in a minute
Accuracy	Percentage of words in a short story read correctly
Comprehension	Questions related to short story read aloud by student or assessor

After collecting this background data, all learners were also given an emergent literacy test composed of six components administered through five sub-tests: letter awareness, single word recognition (reading of most used words), reading fluency and accuracy (words per minute read correctly and total percentage of passage read correctly; both within the same sub-test), and a set of comprehension questions linked to the fluency and accuracy passage. The same set of comprehension questions were administered for both those learners who could read independently (reading comprehension) and those who could not and thus had the assessor read to them (listening comprehension). All instructions were given in Tigrigna, and children were assessed on letter identification, most used words, reading fluency, reading accuracy, and reading/ listening comprehension in Tigrigna. Inter-rater reliability was not provided, but pilot tests were conducted in one of the government primary schools in Wukro town where the enumerators training was conducted.

Analysis

The critical purpose of this analysis is to present a profile of children's reading skills, as well as an in-depth analysis of each skill. Summary statistics will be used to analyze students' performance in each of the reading sub-tests.

Secondarily, this report will test whether the students in the baseline and endline samples are equal in terms of background and skills. That is, at baseline do these students possess the same resources and capabilities as those at endline? This question is important so that we can more confidently estimate how much the Literacy Boost intervention has, or has not, contributed to students' accelerated learning.

To test the comparability of learners in the baseline and endline samples and comparing results with benchmarks set during the baseline assessment, this report will use comparison of means through t-tests assuming unequal variance between the two samples. Summary statistics, accompanied by t-tests, will be used to analyze learners' performance in each of the reading sub-tests. Finally, this report will look to regression models to explore relationships between literacy skills and student background characteristics and home literacy environment.

111. Children's Background

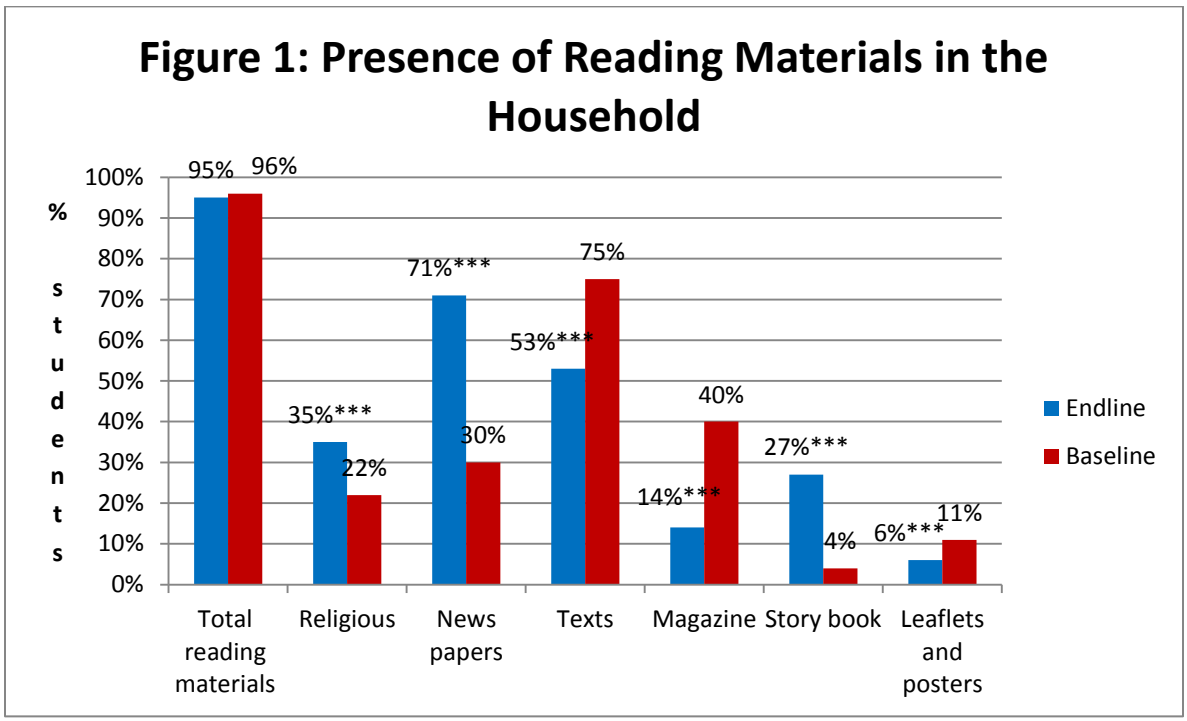
The students are about ten years old on average, and all students speak Tigrigna as their native tongue. About 10% of students have repeated at least one grade. Thirty-eight percent of children have electric power at home and 10% have a television. Fifty-five percent of the children have completed ECCD or the government "0" class. Half of students report living under a roof made of iron sheets, typically an indication of relative wealth in this area. Ninety-seven percent of the children's parents have farming land and 94% have livestock. Finally, nearly 73% children do chores at home and/or help their parents in the farming activities, particularly looking after their livestock. More boys (80%) than girls (65%) report doing chores. On average children reported that they spend one hour and 53 minutes studying and two hours and 17 minutes on chores each day. Given the low amount of study time at home and high amount of

time spent on chores, **Literacy Boost should suggest literacy-supporting activities that can be carried out during chores through Parental Awareness sessions.**

Some important differences exist between Literacy Boost children among the endline and the baseline groups. Fifty-five percent of endline students have attended early-childhood development (ECCD) programs, while only 3% of students during the baseline have attended ECCD. Children during the baseline used to spend 30 minutes per day studying however, during the end line children reported that they spend 1 hour and 53 minutes per day. **This represents both an improvement in access to ECCD programs and students' study habits. This may be due to Save the Children programs in the area, but more information is required to make this conclusion with certainty.**

IV. Children's Home Literacy Environment

An important aspect of reading development concerns the home literacy environment (HLE). How are children exposed to the printed word in the home? How much access do they have to books and print to practice their nascent reading skills? Many Literacy Boost activities are centered on helping parents and communities to enhance the HLE. As such, it is important to measure where learners' HLEs begin, and how they change over the course of time. Figure 1 displays the different types of printed materials that learners may or may not have at home.

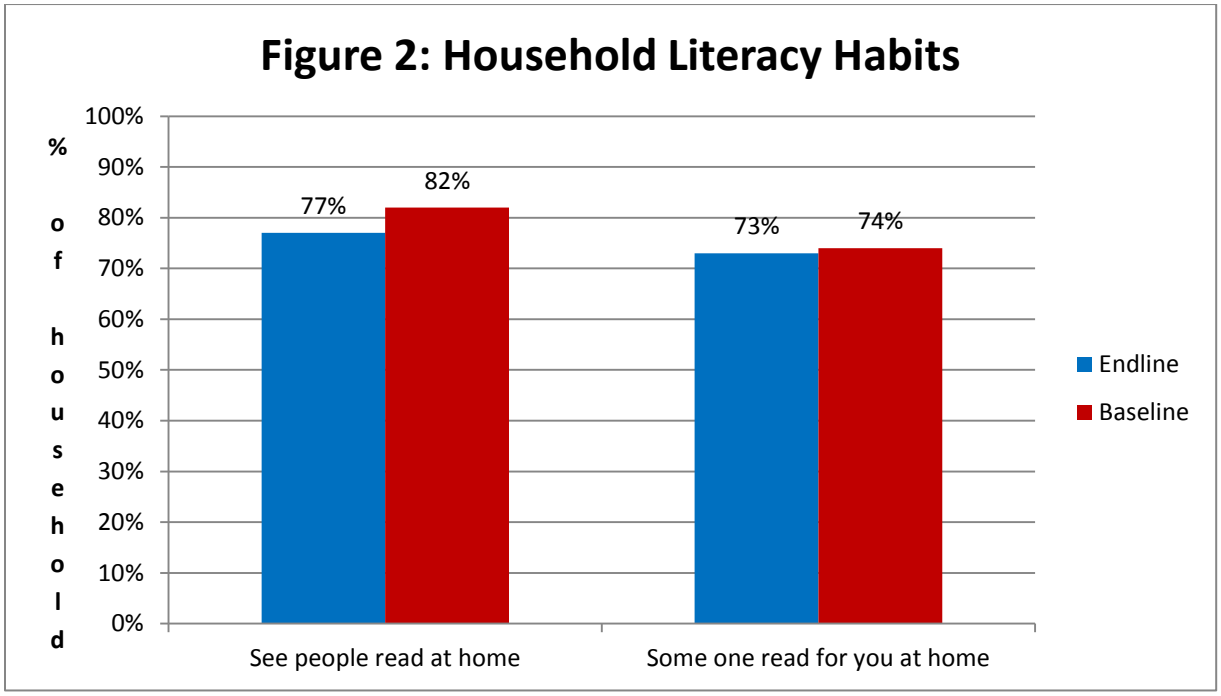


~Statistically significant difference between endline and baseline at p<0.05 *, <0.01**, and <0.001***

Nearly all learners have some type of reading materials at home. Descriptive statistics shows that total reading materials at home has remained equal between baseline and endline, although the prevalence of individual types of books has changed over time. The most common reading

material in students' homes are newspapers, student texts and religious materials during the endline. During the baseline assessment the common reading materials were student text, magazines, and newspapers consecutively. There is highly significant improvement in endline for religious books, newspapers and story books. On the contrary a significant decrease is observed during endline for student texts, magazines, and leaflets and posters, these need further qualitative study for justification. **In general, Literacy Boost should increase children's access to child-friendly types of reading materials, such as storybooks and coloring books, because these types of print are not very widespread among households in this area. The greater prevalence of storybooks in households at endline is encouraging, but Literacy Boost should ensure that the 77% of students who report no storybooks in the home have access to storybooks through such initiatives as Book Banks.**

The HLE is not only about materials in the home, but how those materials are used to engage the child in reading and learning. Hess and Halloway (1984) identified five dimensions of the home literacy environment that are theoretically related to reading achievement in children. The first is value placed on literacy, which we operationalize by asking the learners whether they see anyone reading at home. The second is press for achievement, which we operationalize as individuals telling or helping the student to study. The third is the availability of reading and print materials, which we operationalize as the amount of printed materials at home. The fourth dimension is reading with children, which we operationalize by asking the learners whether anyone reads to them at home. The last is opportunities for verbal interaction, which we operationalize as family members telling stories to learners. Figure 2 shows how the baseline and endline groups measure up in terms of engagement in two of these four home literacy environment activities (the other two were not measured during this data collection)**.**



During the endline 77% of Students report seeing of their household members read in the past week, whereas during the baseline it was 82%. Seventy-three percent of children in the endline and 74% in the baseline have someone to read for them at home. However, these differences are not statistically significant and we can conclude that the prevalence of people reading in the home and reading to children has stayed the same over time. **Literacy Boost should build upon the high literacy of household members in this area to encourage more household members to regularly help children study, to read to children, and to tell children stories.**

V. Children's Reading Skills

This section considers the reading skills one by one, comparing students' average scores in baseline versus endline evaluation.

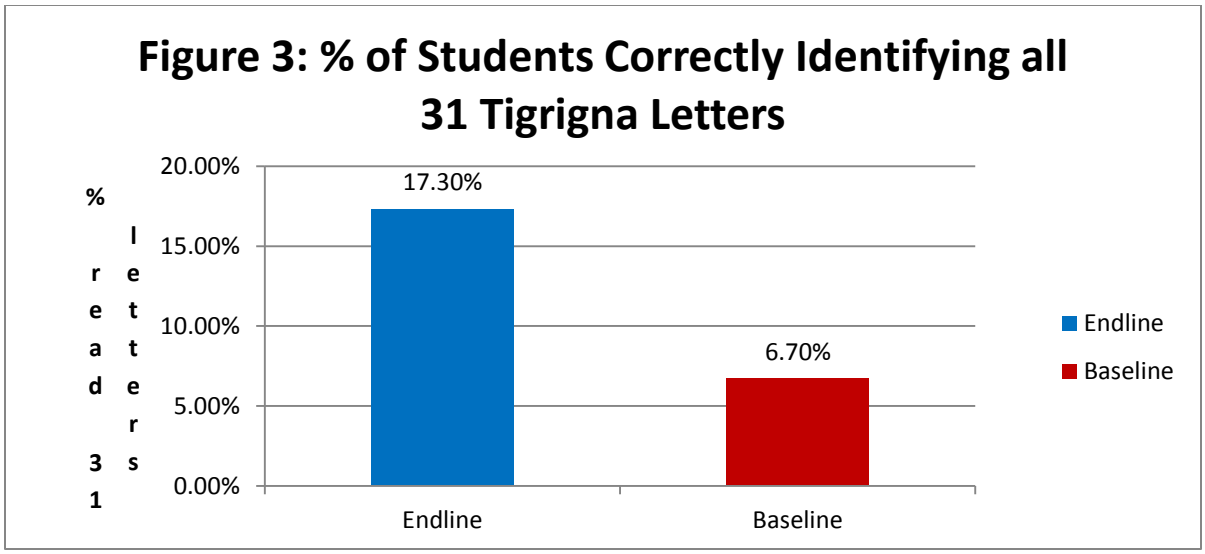
Concepts about Print

The endline sample of students scored 97% of concepts about print questions correct, whereas the baseline sample had scored only 65% correct. **This indicates that students in Literacy Boost schools have mastered their familiarity with the physical components of books and print dynamics, and no adjustment to programming is needed based on these results.**

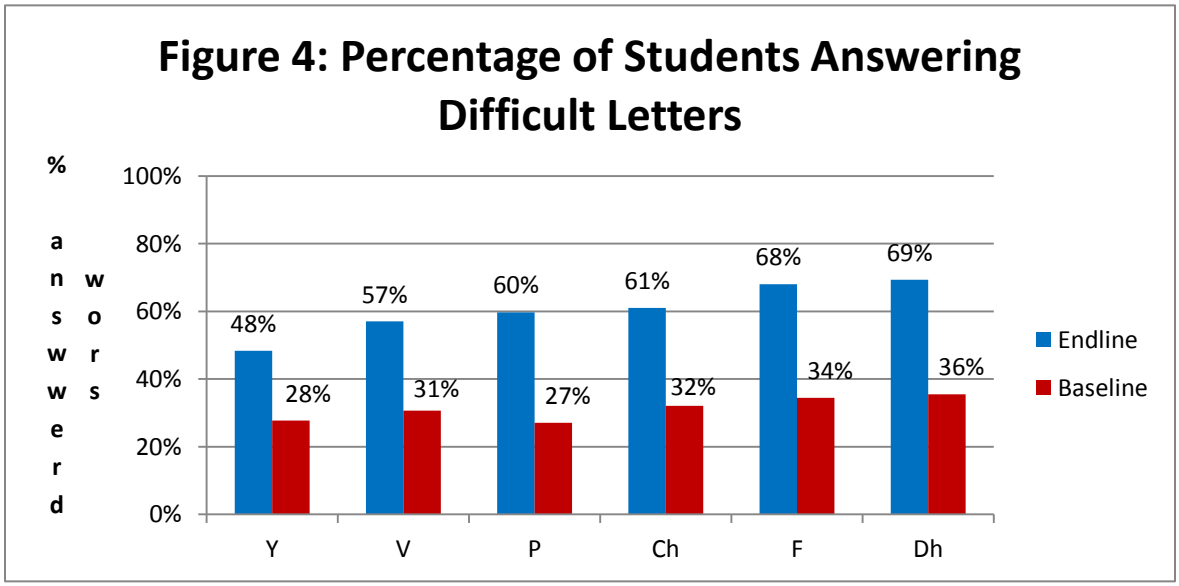
Letter Identification

This sub-test examined learners' letter awareness. Learners were shown a chart of 31 letters and asked to name the letter or pronounce the letter sound. At endline, 78 % of students correctly identified more than 20 letters. Seventeen percent of endline students correctly identified all 31 letters and there was no student who did not know any letters. At the baseline, only 7% of students correctly identified 31 letters and another 7% identified none.

For endline students, The most difficult letters were: Y (ዬ/ye), V (ቨ/vi), P (ፖ/po), Ch (ዠ/zzu), F (ፈ/fi), and Dh (ጰ/pe) and the most often named correctly were: H (ሀ /he), O (ጠ /te), U (ጨ/ce), C (ቸ /che), X(ሐ /ha), S (ሰ /sa), M (ማ /ma). It is clear that the letters that were most commonly known are some of the most commonly used in Tigrigna. They are found in names and many other words commonly used and related to everyday life.



Future Literacy Boost programming should make teachers and community action facilitators aware of the most difficult letters Y (ዪ/ye), V (ቨ/vi), P (ፖ/po), Ch (ዠ/zzu), F (ፊ/fi), and Dh (ጰ/pe) and suggest engaging activities for these actors to practice with children.



As shown above in figure 4, the percentage of students answered difficult letters improved in the endline. For all letters except Y more than 50% of students answered while in the baseline for all letters the score is less than 50%.

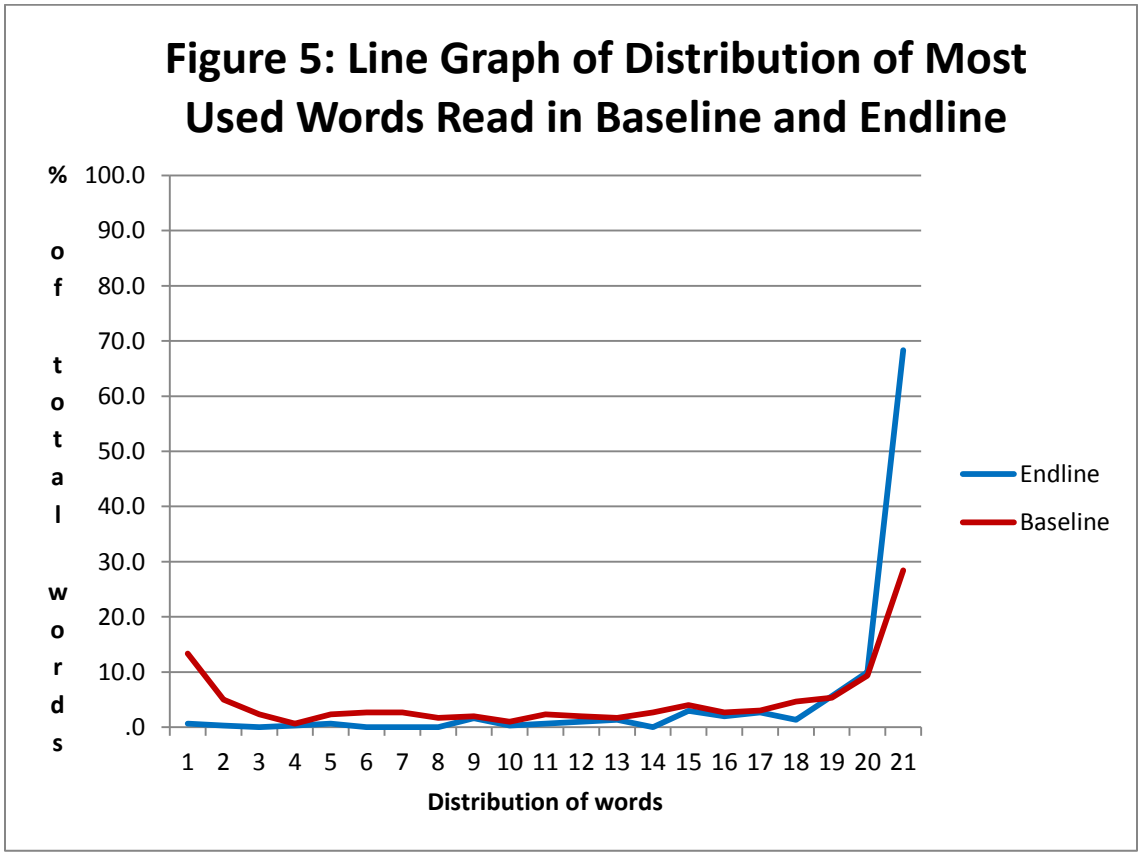
Word Recognition: Most Used Words

The most used words (MUW) sub-test consists of a chart of 20 words that the student is asked to read. These 20 words were taken from the EGRA assessment tool developed by RTI in 2010 and used by Save the Children during the baseline assessment conducted in 2011, and these tools were used in the endline evaluation also.

On average, learners during the endline assessment were able to read 18.5 (92.5%) of MUW. However, children from the same schools, during the baseline assessment were able to read 12.25 (61.25%) of the MUW. There is a very high statistically significant difference between the two groups, meaning that we determine learners during the end line were be able to read more MUW than learners in the baseline, before the Literacy Boost program had started.

As Figure 5 below shows, the distribution of most used word scores was not normal. Eighty-four percent of children in the endline could read 18-20 words correctly, and 68% were able to read all the 20 MUW correctly. However, during the baseline only 43% of the children could read 18-20 words correctly. During the baseline assessment 13.4% of children could not read any words but in the end line assessment only 0.7% could not read any words correctly.

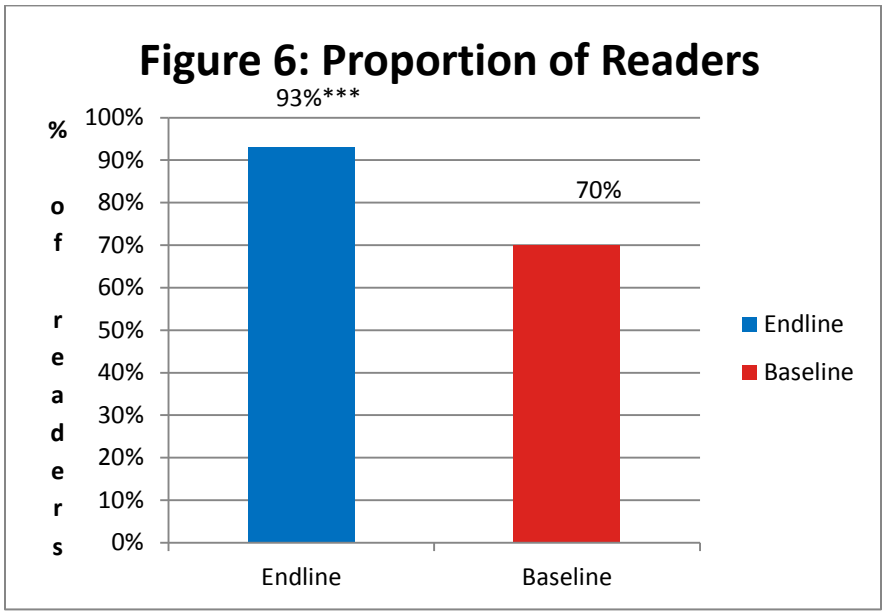
Literacy Boost programming should equip teachers on how to effectively utilize the results of formative assessment in identifying difficult MUW and helping children master on them.



Proportion of Readers and Nonreaders

After the most used words sub-test, students are then asked to read aloud a passage of connected text of 65 words in length. This passage is based on the most used words and passages found in students' language arts textbooks. At this point in the assessment, assessors classify students as either 'readers' or 'nonreaders.' Readers are defined as students who were

able to read at least 5 words correctly in the first 30 seconds of reading. Figure 5 shows the percentage of Readers.

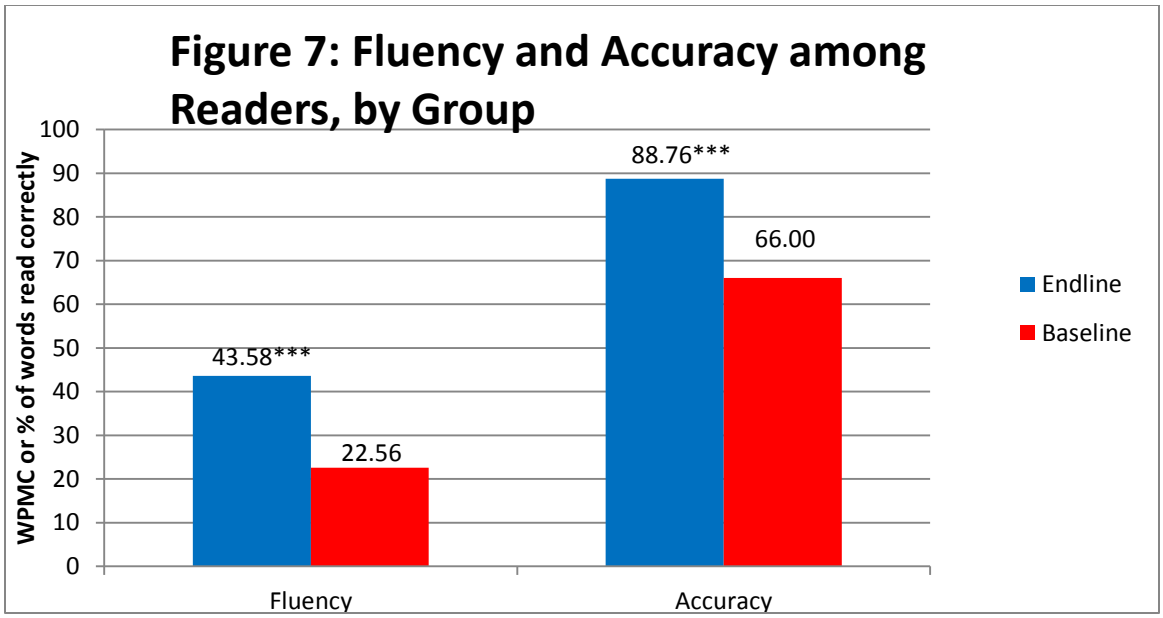


Ninety-three percent of students in the endline were able to read at least 5 words correctly in 30 seconds, while only 70% of students were able to meet this threshold in the baseline. There is a highly significant difference between baseline and endline percentages. All other students were classified as nonreaders, and were read the passage by assessors. **This represents excellent progress for children in Literacy Boost schools.**

Fluency and Accuracy

Fluency (words per minute read correctly) and accuracy (percent of the passage read correctly) are presented together here because they are measured together in a single sub-test in which learners read a passage aloud. The number of words learners read correctly in a minute is tracked for fluency. As the student continues to read after the first minute, the total number of words read correctly from the passage as a whole, no matter how long it takes the student, is computed for accuracy. This section presents this data for readers only[1] in order to better understand the strengths and weaknesses of students who can read a degree of connected text.

[1] As opposed to including the zero scores of the nonreaders, which would lower the average scores for this data.



The average fluency rate in the baseline was 22.56 words per minute correct and there was improvement in end line to 43.58 words per minute correct. There is a highly significant difference between baseline and endline evaluations. The percentage of accuracy was 66% in the baseline and 89% in endline evaluation, again with a highly significant difference between baseline and endline evaluation.

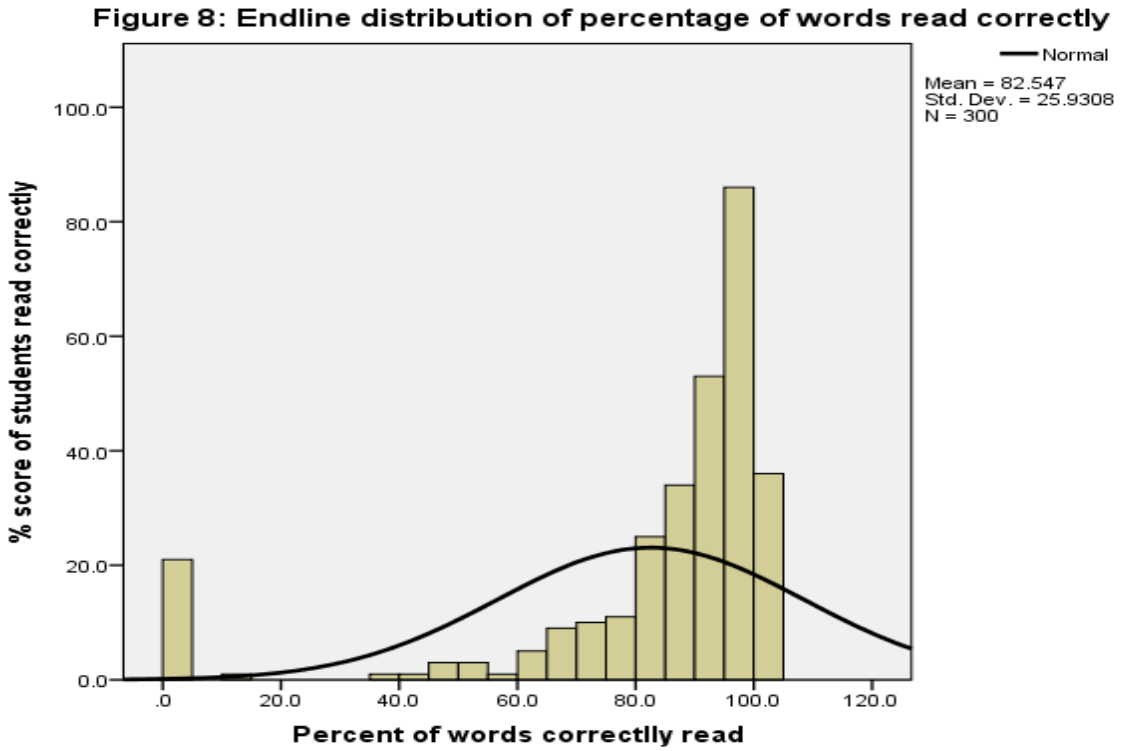
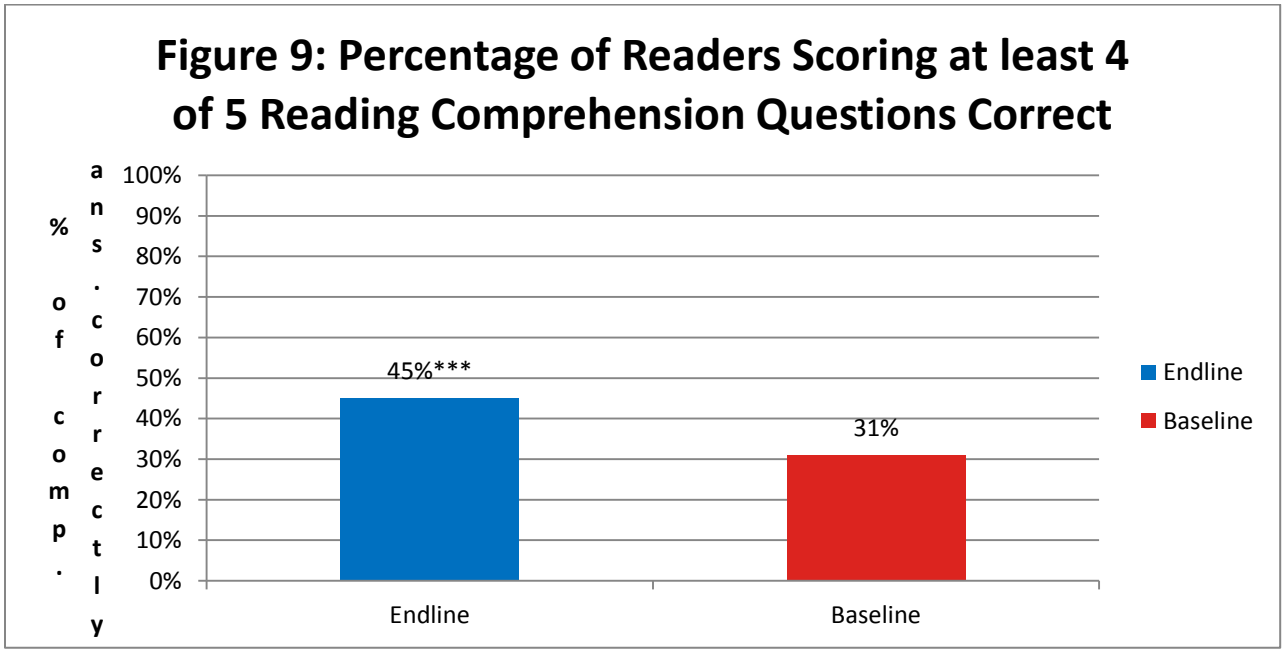


Figure 8 above presents distribution for percentage of words correctly read in one minute for all students, including nonreaders. The distribution is skewed to the left in other words most students scored above the average of 82.55. **These readers will need continued opportunities to practice their reading through activities such as Reading Camps, Reading Buddies, etc. The small percentage of nonreaders (7%) will need more remedial help with their letter knowledge, phonemic awareness, reading of single words, etc.**.

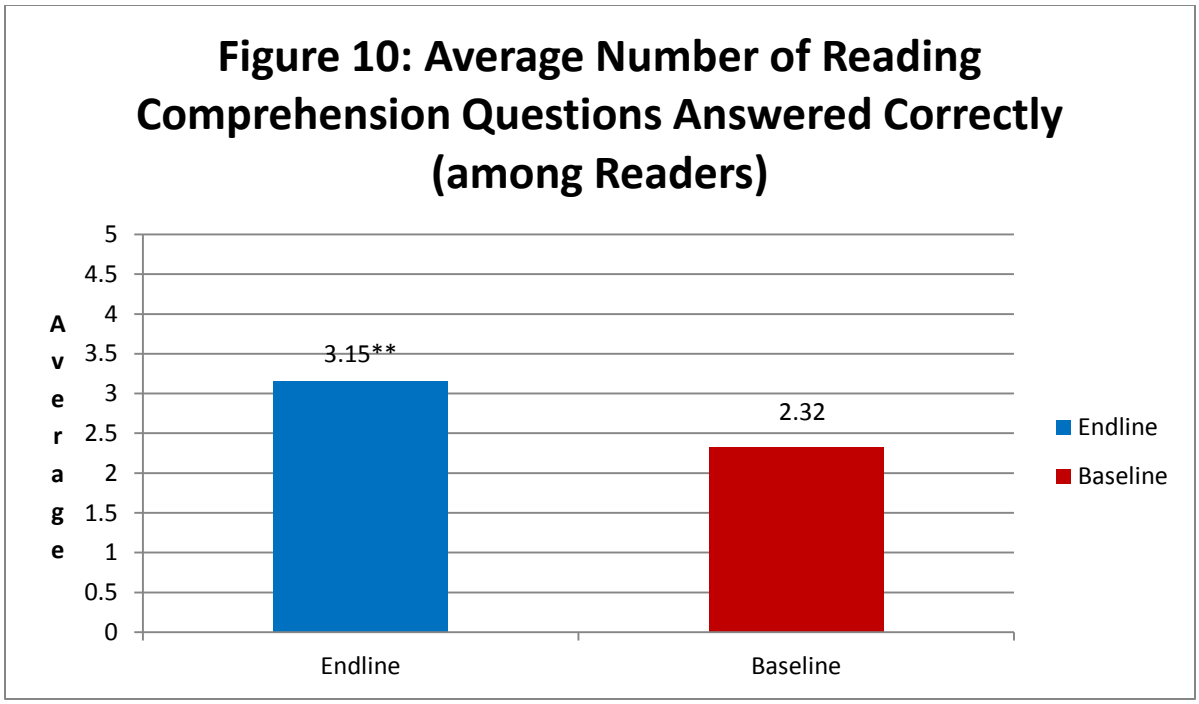
Reading and Listening Comprehension

The final sub-test quizzed students who qualified as readers on a series of five comprehension questions related to the reading passage. This section presents this reading comprehension data for readers only and listening comprehension data for nonreaders only.

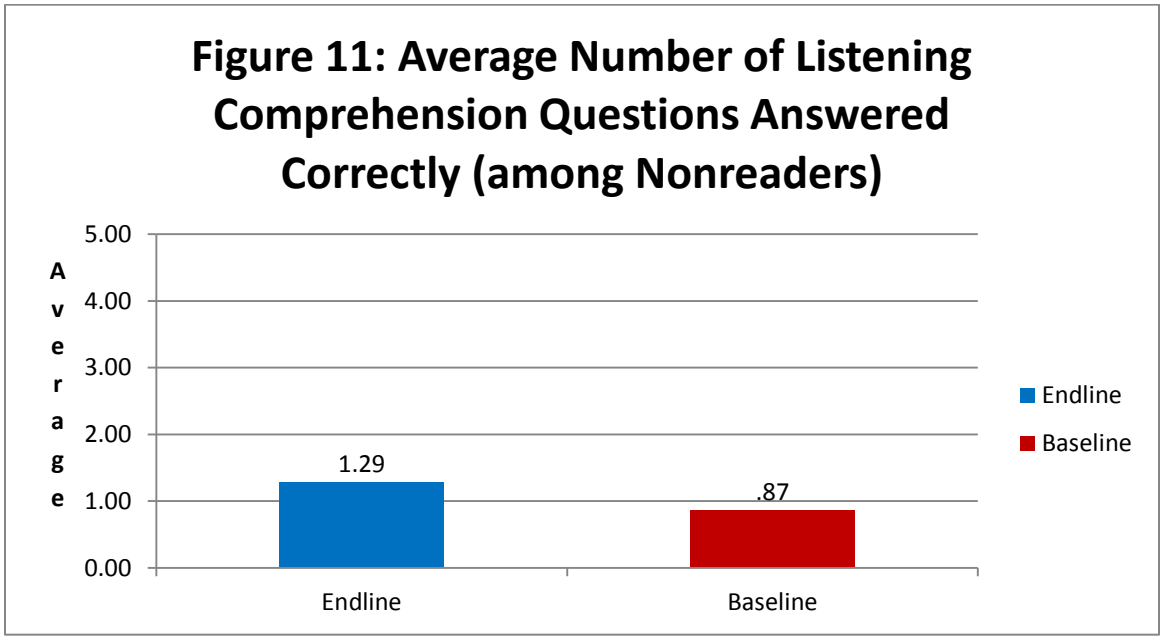
The percentage of readers who score four or five comprehension questions correct during end line evaluation is 45% while for baseline is 31%. This difference is highly significant between endline and baseline.



The average number of reading comprehension questions answered correctly for endline is 3.15 and 2.32 for baseline, as shown in the following Figure 10. There is a highly significant difference between baseline and endline. **Thus, it is likely that Literacy Boost helped students increase their reading comprehension skills, but more reading comprehension activities need to be integrated into programming in order to bring the average closer to all five questions answered correctly.**

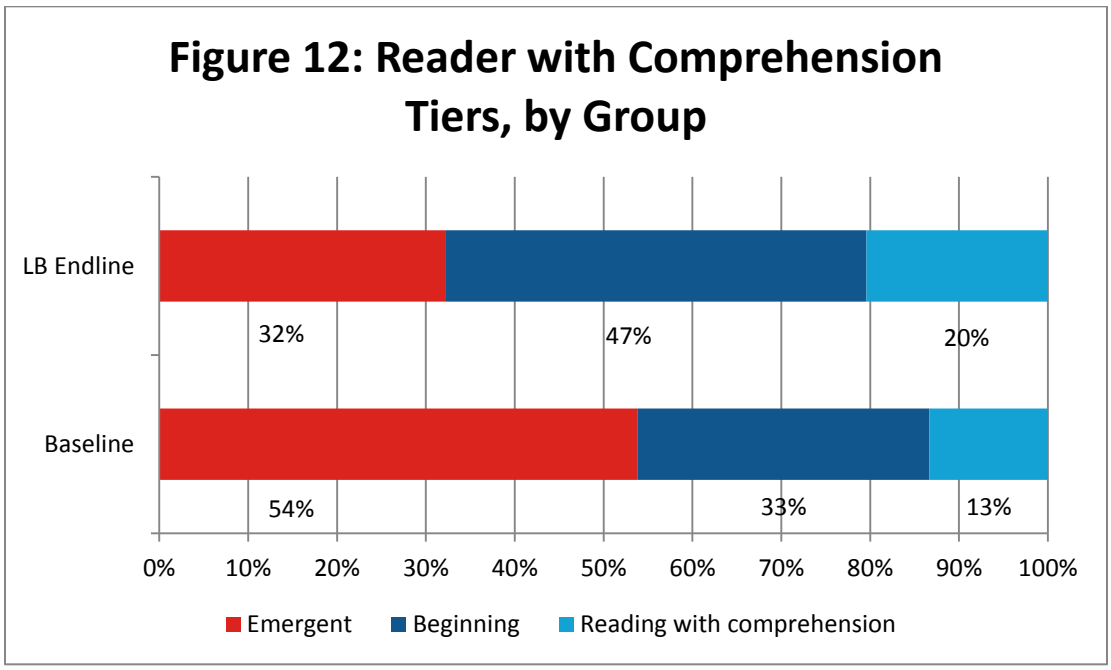


As Figure 11 shows, the average number of listening comprehension questions answered correctly for endline is 1.29 and 0.87 for baseline. There is no significant difference between baseline and endline. **This may indicate that non-reading children need more help than with their foundational skills of letter knowledge and phonemic awareness, they may also need help with their verbal skills such as listening, vocabulary, etc.**



Readers with Comprehension

Students' reading with comprehension is the ultimate goal of Literacy Boost. As such, a new composite measure to focus attention on this goal as well as to track progress in terms of equity, in terms of all children reading with comprehension, is displayed below in Figure 11. The Literacy Boost program classifies students into Emergent, Beginning, and Reading with Comprehension tiers based on their comprehension skills. Beginning readers are defines as those students reading a grade-level passage and answering at least 50% of comprehension questions correctly. Reading with comprehension is defined as reading a grade-level passage with such skilled comprehension that the child correctly answers at least 80% of comprehension questions. All other students are considered Emergent readers.



Note: Emergent Readers correctly answers less than 50 percent of the comprehension questions; Beginning readers correctly answers between 50 but less than80 percent of the questions correctly; Readers with Comprehension correctly answers more that 80 percent of the comprehension questions. Tier cut-offs were set in combination with associated fluency and accuracy levels in each language and country, vary based on the number of comprehension questions asked.

In this sample, we see that 32% of end line evaluation students and 54% of baseline students are classified as being Emergent readers (Figure 11), with 47% of endline students and 33% of baseline students classified as Beginner and 20% of endline students and 13% of baseline students achieving the ultimate goal of Reading with Comprehension. This indicates that, while progress is being made, reading and comprehension skills are still quite low. There were highly significant differences between endline evaluation and baseline students on this measure.

VI. Learning Equity and Struggling Students

As part of t-test and regression analysis, an equity analysis was performed to examine whether reading scores were significantly correlated with traditional dimensions of inequity: sex, socio-economic status (SES), home literacy environment (HLE), work/chore load, and prior early childhood development (ECD) program attendance. Table 2 below presents an outline of which groups had significantly lower scores at baseline.

Table 2: At end line evaluation, which groups are disadvantaged?

Sub-test	Sex	SES	HLE	Work	ECCD
Letters					**No ECCD
MUW					**No ECCD
Reader					**No ECCD
WPMC					**No ECCD
Accuracy					**No ECCD
Reading Comp					

Linear regression analysis results revealed that those students who completed ECCD have a greater chance to identify letters and words, read a higher number of words correctly per minute and have higher accuracy, keeping other variables constant (sex, SES, HLE and HLE) constant. Only ECCD status had a significant relationship with reading skills. There was no significant difference for reading comprehension between those who did and did not complete ECCD. **This is strong evidence for scaling up quality ECCD programs in Ethiopia.**

The multivariate regression analysis results of each outcome or dependent variable are presented in Appendix B. Other than ECCD participation, the children who were able to name their favorite book from the Book Bank have significantly higher scores in all outcomes except concepts about print. However, exposure to reading buddy, participation in reading camps and reading materials in home do not have a significant relationship with outcome variables. Bivariate analysis between outcome variables and the following explanatory variables (participation on reading buddy activities, participation in reading camp activities, borrowing books and listing of one favorite books) revealed similar results with multivariate analysis **More information is necessary to fully explain these results, but all community action activities should be continued in order to give all children the opportunity for remedial and advanced practice of their reading skills outside of school.**

Finally, children who repeated scored lower on letter knowledge than those who had never repeated. **Grade repetition is a good targeting mechanism to prioritize students for remedial interventions.**

VII. Conclusion and General Program Recommendations

Conclusion

Table 3: Summary of important findings

Literacy Outcome	Description	Baseline Mean, Literacy Boost Schools	Endline literacy boost schools	Baseline 75th percentile (benchmark)	Achieved benchmark or not
Concepts about Print	Number concepts demonstrated correctly of 14	9.13	13.56***	12	Yes
Letter knowledge	Number of letters/sounds	14.92	24.58***	26	No
Reading Single Words	Number of common vocabulary words read correctly of 20	12.55	18.5***	13.32	Yes
% of readers	Percent of group that read at least 5 words correctly in 30 seconds (of reading passage)	70%	93%***	N/A	N/A
Fluency (among readers)	Number of words in a connected text read correctly in a minute	22.56	43.58***	35	Yes
Accuracy (among readers)	Percentage of words in a connected text read correctly	64.11%	88.76%***	91.66%	No
Reading Comprehension (among readers)	Number of comprehension questions answered correctly after reading text aloud	N: 210 2.32	N: 279 3.15***	4	No
Listening Comprehension	Number of comprehension questions answered correctly after listening to text read aloud	N: 90 .87	N: 21 1.29	2	No

***** Statistically significant at p<0.001**

The above table shows that there is highly significant difference between base line and endline samples for all literacy outcome variables after literacy boost intervention. Baseline benchmarks were met for concepts about print, most-used words, and fluency. While benchmarks were nearly met for letter knowledge and accuracy, the benchmark for the most important skill of reading comprehension was not met by a wider margin.

When we compare outcome variable of endline evaluation of literacy boost results between students having previously participated in ECCD intervention and those who had not, there is a significant difference between the two in the favor of ECCD participants.

There is no significant difference observed between home literacy environment in baseline and endline literacy boost with the exception of types of print reported in the household. Encouragingly, more children reported seeing storybooks in the household at endline than at baseline.

Recommendation

- The Literacy Boost intervention appears to have a crucial impact on learning outcomes therefore it is recommended to scale up to regional as well as national level.

- Future Literacy Boost programming should focus on students' skill deficiencies such as letters Y (ዬ/ye), V (ቨ/vi), P (ፖ/po), Ch (ዠ/zzu), F (ፊ/fi), and Dh (ጰ/pe) and words similar to the most difficult most used words. Students who can read a degree of connected text should be given more opportunity to improve their speed and accuracy through activities such as Reading Camps and Reading Buddies. Finally, teachers and community action facilitators should be given a variety of suggested fun activities to better engage children in reading comprehension practice.

- Grade repetition is a good targeting mechanism to prioritize students for remedial interventions.

- ECCD intervention is critical for students to achieve satisfactory learning outcomes. Therefore, it is recommended to strengthen the current zero class government started, and the findings presented in this report can be used as strong evidence for scaling up quality ECCD programming in Ethiopia.

- It is recommended to design strategy to improve home literacy environment. The students who still report no storybooks in the home will need alternate access to storybooks through initiatives such as Book Banks. Furthermore, the high literacy rates among household members means that household members should be encouraged to more frequently help their children study, read to them, and tell them stories.

Appendixes

Appendix A: Full Background and Home Literacy Environment Statistics

Table A1: Background Characteristics by Sample Group

Child Background Characteristics	***End line (N=300)***	***Base line (N=300)***
Age	9.97	9.77
% male	47%	51%
% have attended ECD program	55%***	3%
% have repeated at least one grade	8%	3%
Electricity in house	38%	21%
Economic aggregate[a]	14.72	15.53
Reading materials in house	95%*	96%
See people read in home	77%	82%
Read to student at home	73%	74%

*** Statistically significant at p< 0.001, and * Statistically significant at p<0.05

[a]Economic aggregate is the sum of livestock households have to sheep or goat based on current market for example one cow is considered as five sheep or goats and one sheep is equal to one goat.

Appendix B. Regression Analysis Results

	Outcomes (Dependent variables)					
Explanatory variables	CAP	Letter ID	Total word identification	Fluency	Accuracy	Reading comprehension
Constant	12.72 (0.467)***	12.33 (3.651)**	14.01 (1.804)***	19.05 (9.395)*	47.60 (4.546)***	2.09 (0.853)*
Complete ECCD	0.204 (0.105)	3 (0.821)***	1.05 (0.406)*	5.81 (1.958)**	3.04 (0.948)**	-0.03 (0.178)
Ever repeat or not	-0.065 (0.195)	-4.3 (1.5)**	-1.36 (0.754)	-7.2 (3.812)	-3.14 (1.845)	-0.5 (0.346)
Type of house roof	0.58(0.103)	0.116 (0.809)	0.31 (0.4)	0.97 (1.913)	-0.72 (0.926)	-0.09 (0.174)
Electricity in house	-0.010 (0.113)	0.264 (0.881)	0.19 (0.435)	-0.10 (2.092)	0.21 (1.012)	-0.015 (0.19)
Economic aggregate	0.004 (0.004)	0.019 (0.03)	0.02 (0.015)	-0.012 (0.069)	0.03 (0.33)	-0.004 (0.006)
Reading materials in home	-0.109 (0.228)	0.151 (1.785)	-0.63 (0.882)	-2.04 (4.265)	2.44 (2.064)	0.16 (0.387)
See people read in home	0.003 (0.126)	1.287 (0.983)	0.54 (0.485)	-1.2 (2.434)	0.38 (1.178)	-0.012 (0.221)
Did you participate in reading buddy activities in your school	0.247 (0.133)	-1.037 (0.921)	-0.41 (0.515)	-3.08 (2.434)	-1.36 (1.207)	0.03 (0.227)
Did you participate in reading camp activities in your village	0.117 (0.118)	1.346 (0.921)	0.19 (0.455)	5.14 (2.198)	0.89 (1.064)	0.1 (0.2)
Did you borrow books	0.161 (0.178)	0.676 (1.392)	0.4 (0.688)	0.445 (3.46)	-2.35 (1.674)	0.13 (0.314)
Can you name one favorite book	0.525 (0.270)	8.862 (2.11)***	2.96 (1.043)**	17.69 (5.858)**	10.72 (2.835)***	1.1 (0.532)*
Number of observation	294	294	294	273	273	273
Adjusted R squared	0.014	0.131	0.049	0.066	0.086	-0.007

*** Statistically significant at p<0.05, ** Statistically significant at p<0.01 and ***Statistically significant at p<0.001**

The above multivariate regression analysis results of each outcome or dependent variables depicts that ECCD have significant effect on outcome variables. Similarly naming of favorite book has significant effect on outcome variables. However, exposure to reading buddy, participation in reading camps and reading materials in home do not have significant effect on outcome variables. Bivariate analysis between outcome variables and the following explanatory variables (participation on reading buddy activities, participation in reading camp activities, borrowing books and listing of one favorite books) revealed similar results with multivariate analysis shown above.