

Early grade reading skills: endline assessment of read interventions in Khagrachari, Chittgong Hill Tracts

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Abstract

In 2015, Save the Children, supported by USAID, in partnership with a local NGO, Zabarang Kalyan Samity (ZKS), undertook the Reading Enhancement for Advancing Development (READ) project in the Khagrachari district of the Chittagong Hill Tracts. It included 45 government primary schools at 3 upazilas in the district in a multi-lingual environment.

A report on “Baseline Assessment of Early Grade Reading Skill in Khagrachari” was published in this journal in June 2017, Volume 16, Number 1. Quantitative and qualitative data then revealed that languages spoken at home, socioeconomic status, and the home literacy environment—especially access to reading materials at home— were the main drivers of language learning status and disparities in his respect.

The purpose of this endline evaluation study was to collect and assess the background information and household level data of grade 1-3 children at the sampled schools, assess the reading competencies of grade 1, 2, and 3 children using the EGRA (Early Grade Reading Assessment) tool, and collect and assess the recent Bangla marks obtained by children who have recently passed grade 3 in the surveyed schools.

Almost 100% of students reported understanding the language of instruction (Bangla) even though most students (both control and treatment groups) spoke either Chakma or Tripura at home. There were no significant gaps in literacy achievement by gender or between students of high and low SES at the endline. Students at READ schools scored better on emerging literacy skill tasks (letter knowledge, and reading most frequent words, similar beginning words and rhyming words) than in control schools at a significance level of $p < 0.01$. They also scored better on higher order literacy skill tasks (accuracy, fluency and comprehension). Students at READ schools were more likely to be Readers with Comprehension (defined as readers who answered at least 80% of the comprehension task correctly). Students who had a strong home literacy environment (defined as noticing more than three family members reading) were more likely to be strong readers. Overall, though students’

fluency in reading increased from grade to grade, fluency remained a challenge for students both in treatment and control groups.

Recommendations were made to give parents the tools needed to engage in greater depth with their child's education. Further research was suggested on how the first language was used in the classroom to support literacy and language acquisition in Bangla.

Key Words: *Early Grade Reading, Reading in Multi-Lingual Context, Chittagong Hill Tracts.*

1. Introduction

Early grade reading competence is critical to the overall educational success of a child. Researchers have found that early grade students who fall behind in reading skills perform progressively worse in later grades (Crouch, 2012) and that the achievement gap continues to impact the overall literacy of a child even after ten years (Cunningham and Stanovich, 1997). Poor early grade readers are also more likely to repeat grades (Annie E. Casey Foundation, 2010). As such, the current state of reading proficiency among early grade students in Bangladesh is a matter of concern.

Overview of Read

In this context, the Reading Enhancement for Advancing Development (READ) project, supported by United States Agency for International Development (USAID) was started in September 2013; READ reinforces the government's existing efforts to enhance the quality of education in Bangladesh. The Government of Bangladesh's (GOB) Third Primary Education Development Plan (PEDP III) provides a comprehensive framework to address many of these challenges. The overarching goal of READ is to improve early grade Bangla reading competencies among grade I-3 students. READ aims to directly benefit an estimated 1.1 million grade I-3 students in 5,112 READ-supported schools in selected districts of Bangladesh.

The project focuses on four areas of intervention: 1) teacher education and continuous professional development, 2) reading assessment, 3) increased availability of reading material, and 4) increased opportunities in the community to read and support beginning readers outside of the school walls. Specifically, READ addresses phonemic awareness, letter knowledge, vocabulary, fluency and comprehension through these four areas of intervention. As such, the project anticipates a lower rate of dropout and repetition in grades in primary education in selected districts by building a strong foundation.

In 2015, READ (in partnership with a local NGO called Zabarang Kalyan Samity (ZKS)) started working with 45 government primary schools at 3 upazilasin the Khagrachari district in the Chittagong Hill Tracts in a multi-lingual environment. Prior to the READ intervention, SCI commissioned a situational analysis on language use in schools and communities as well as a baseline study to assess reading skills and collect information on student background characteristics. In accordance with the methodological requisites of a repeated cross-sectional design, the baseline for this study was conducted at the beginning of the school year while the endline was done at the end of the school year.

Research Questions

The purpose of the endline evaluation was to collect and assess the background information and household level data of grade 1-3 children of the sampled schools, and assess the reading competencies of grade 1, 2, and 3 children in the surveyed schools.

Specifically, the CHT (Khagrachari) endline study aimed to answer the following questions:

- What do we know about grade 1-3 students' learning environment at home and at school?
- What are the reading abilities of grade 1-3 students in GPS schools in the Khagrachari district?
- What are the reading abilities of grade 1-3 students who have participated in the READ project in the Khagrachari district?
- What is the impact of READ? How do reading abilities compare to baseline results for control and treatment groups?

The study was conducted using a repeated cross-sectional design. This methodology calls for taking a snapshot of a given population at a specific time and, as such, is commonly used to measure pre- and post- test results of an intervention such as the READ program. The respondents were students of grade 1, 2 and 3 in schools where the READ project was implemented (treatment group) and schools that did not have the READ project (control group). Data were collected using tablets and Tangerine software.

Methodology

To measure reading outcomes for students, the Early Grade Reading Assessment (EGRA) tool was used. EGRA is an assessment tool developed through the collaboration of large network of scholars, practitioners, governments and education development institutions, seeking to enhance early reading assessment of primary school children in various low-income countries. The assessment tool has been used in Afghanistan, Bangladesh, Egypt, the Gambia, Guyana, Haiti, Honduras, Jamaica, Kenya, Liberia, Mali, Nicaragua, Niger, Peru, Senegal and South Africa. It is conducted through examinations, interviews, surveys and classroom assessments to obtain information on the reading ability and learning outcome of students, and educational support from family members, schools and community.

The tests are intended to measure reading assessment based on reading fluency, comprehension, letter identification, pronunciation, vocabulary, familiarity with books, etc. Through comparisons between different regions, ethnic minorities and subgroups of students, the overall quality of education that they receive is assessed to decide whether schools, teachers and students need additional support. Table 1 lists the reading outcome variables that were used in the contextualized EGRA tool for the purposes of this study. Grade 1-3 assessments included all of the variables presented in this table except for the variable 'antonyms', which was only used in the grade 3 assessment.

Table 1: Egra Reading Outcome Variables and Definitions

Outcome Variables	Definitions
Letter Identification	The number of letters (out of all 50 letters of the Bangla alphabet) for which the child either correctly gave the name, the sound, or a word that begins with that letter.
Most Used Words	The number of words (out of 20 of the most frequently used words in children's textbooks) correctly read aloud by the child.
Similar Beginning Sounds	The number of similar beginning sounds detected (from a Bangla textbook) correctly from a set of 3 words out of which 2 words have a similar beginning sounds.
Ending Rhyme in Words	The number of ending rhymes detected (from a Bangla textbook) correctly from a set of 3 words out of which 2 words correspond with the same ending rhyme.
Pseudo Words ¹	The number of nonsense words (out of 20) correctly read aloud by the child, as a test of children's decoding skills.
Antonyms	The number of antonyms given (for 10 words from a grade 2 and 3 Bangla textbook) correctly by the child.
Sentence Making ²	The number of words (out of 8 words from a grade 3 Bangla textbook) appropriately used to make a sentence by the child.
Reader	A child who can read the oral reading passage independently, here defined as reading at least 5 words correctly in the first 30 seconds of the sub-test. Readers were allowed to continue reading until they finished the passage or refused to read any further; non-readers were stopped and read the passage by the assessor.
Fluency	Tested during the oral reading passage sub-test, fluency is defined as the number of words read correctly per minute. As assessors marked the child's progress at 30 seconds, this measure is calculated by counting the number of words correct at the 30-second mark and multiplying this number by two.
Accuracy	Tested during the oral reading passage sub-test, the percentage of the total words in the passage read correctly by students.
Reading Comprehension	Children's ability to correctly answer 10 questions following the administration of the oral reading passage sub-test.
Readers with Comprehension	Children who qualified as readers and answered at least 80% of reading comprehension correct. This is a binary variable that includes all children in the sample, similar to the reader variable. Here, reading comprehension is 1 if the child was a reader and answered at least 80% of comprehension questions correctly and 0 otherwise, including non-readers.

¹ Pseudowords was used only in the baseline assessment.

² Sentence-making was used only in the baseline assessment.

Sample Size

There were 70 schools surveyed for the endline study, divided equally into treatment and control groups. For the treatment groups, SCI provided a list of 35 schools³ where the project was being implemented; these schools were designated as the treatment groups. For the control groups, 35 schools were selected randomly.

From each school, 30 students were selected for the study with 10 students from grade 1, 10 students from grade 2 and 10 students from grade 3. Students' names were randomly selected from the existing attendance registers to make up the total sample population. Thus, the total proposed sample size was 2100. Data was collected from 2210 students (1066 male and 1055 female). From those students, 125 were used to conduct reliability tests while the remaining 2085 students in the sample were used as the sample population for the analyses described in the following chapters. A similar procedure was utilized for sample selection at the baseline. The sampling distribution divided into treatment and control groups for both the baseline and endline studies is shown in Table 2 below.

Table 2: Sampling Distribution

	Grade 1			Grade 2			Grade 3		
	Treatment	Control	Total	Treatment	Control	Total	Treatment	Control	Total
Baseline	353	357	710	343	355	698	341	363	704
Endline	351	339	690	350	339	689	352	354	706

Data Collection

In total, 24 enumerators and 6 field supervisors collected data. All of the enumerators were recruited from the local communities and were speakers of the languages used in the sample schools in which they collected data. In total, 8 enumerators were selected from the Chakma community, 5 enumerators from the Tripura community, 3 enumerators from the Bangla community and 9 enumerators from the Marma community. A five-day long training session was arranged for enumerators. In the training sessions, the questionnaire for all three grades was described and multiple mock tests were conducted to make sure that enumerators' understanding of the questionnaire was clear and they were able to use the tablet proficiently. They were also given guidelines on how to interact with children.

The assessment was conducted on the school premises outside of the classroom to minimize distractions and to prevent other participants from learning information that might influence their responses in their respective interviews.

The data collection took place in October 2017. For the EGRA assessment, enumerators used tablets to collect data using Tangerine⁴. Enumerators uploaded data to the Tangerine interface at the end of each day. To ensure data validity, a 'High Frequency Check' was

³ The schools used for the sample in the endline were different from those used for the baseline study.

⁴ Tangerine is an open source data collection tool.

conducted daily to ensure that incoming data met the required criteria: non-empty value for unescapable variables; logic; age within a low and high limit, etc. After all data were collected, a database expert cleaned and prepared the database. Data compilation and cleaning was supervised by the database development at INNOVISION. In addition, data were sent to SCI for further checking.

The data analysis employed several different statistical models. For EGRA variables, difference in differences (DiD) was applied to measure the progress in comparison to baseline data. Multiple regression analyses were used to explore the significant differences between control groups and treatment groups as well as differences between baseline and endline results for both groups. In addition, Pearson's *r* was performed to uncover relationships between selected variables in the control and treatment groups. The variables that were used for the analyses are summarized in Table 3 below.

Table 3: Key Variables (socio-demographic, Education Background, Home Learning Environment and Reading Assessment)

Socio-Demographic Variables	Education Background Variables
<ul style="list-style-type: none"> • Age • Sex • Number of family members • Household assets 	<ul style="list-style-type: none"> • ECCD (pre-primary) • Change of School • Repeat in class
Home Learning Environment Variables	Reading Assessment Variables
<ul style="list-style-type: none"> • Reading time • House tutor • Chores • Story-telling and reading to the children by family members and encouraging them • to study • Children seeing their family members read • Availability of other reading materials 	<ul style="list-style-type: none"> • Alphabet knowledge • Identifying most used words • Detecting similar beginning sounds • Detecting ending rhyme from set of words • Vocabulary (name of fruits and vegetables, antonyms) • Reading fluency • Reading accuracy • Reading comprehension

Ethical Consideration

Formal approval of District and Upazila Education officials was taken to conduct the study. As the study was conducted in schools with students of Grade 2 and 3, who are minors (<18 years of age), informed verbal consent of the Head Teacher was taken before data collection. In addition, verbal assent was taken from all students before starting the interview. Consent

and assent givers were informed about the objective of the study, along with their roles. Respondents were given unique ID number to maintain anonymity. Confidentiality of the data was maintained to the highest regard.

Limitation

The local dialect of Khagrachari area could be a language barrier in data collection. The best effort was made to recruit enumerators from that region. Support of teachers and school staff was taken to facilitate communication.

**2. Learner Characteristics at School and Home
Learner Characteristics**

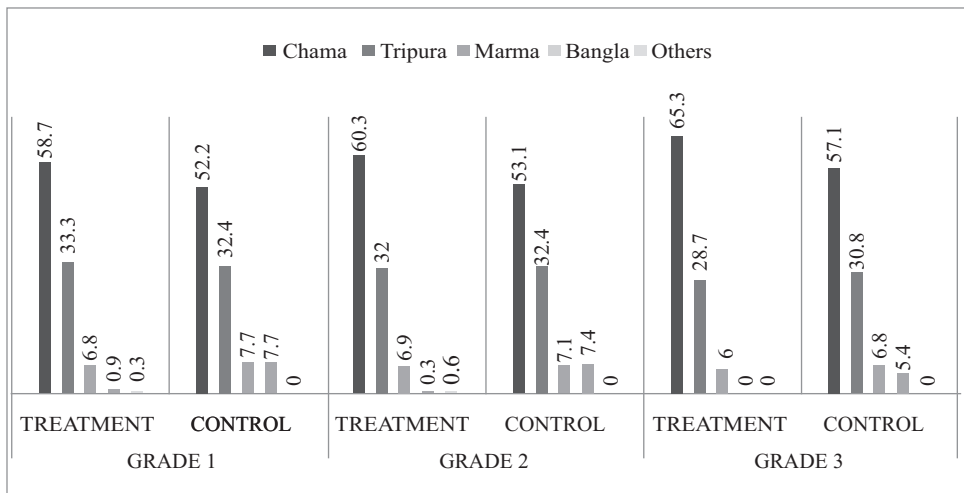
Age

At the time of the baseline study, grade 1 students from both READ schools and control schools reported of being 7 years old (63%), grade 2 students reported of being 8 years old (51%) and grade 3 students reported of being 8 (32%) or 9 years old (43%). At the time of the endline study, students from all three grades reported of being younger than the students sampled at the baseline (6 years for grade 1 (73%), 7 years for grade 2 (71%) and 8 years for grade 3 (64%)). The reason for this discrepancy is unclear as students would typically grow older as the school year progresses.

Ethnicity and Language

The majority of the sample population is Chakma. Figure 1 shows the ethnicity according to grade and compares them by treatment and control groups. Over 50% of the total sample is Chakma. Approximately 30% of the sample is Tripura. A small minority of the students in the sample are Bangla and Marma.

Figure 1: Ethnicity Grades 1-3



As might be expected from the ethnicity results, approximately 50% of students reported speaking Chakma at home these results were similar for both baseline and endline studies⁵. Roughly 30% of students reported of speaking Tripura at home. Nearly 13% of students reported of speaking Bangla at home for the baseline study, but this number decreased for all grades to almost 4% of students in the endline study. Approximately 7% of students reported of speaking Marma at home for both baseline and endline studies. The survey also asked students the language that they used with friends and these results are very similar to the results of home language. These results may indicate that students tend to have friends that speak the same home language as them and share the same ethnicity.

Socio-economic Status

The study showed that there is a range of socioeconomic statuses in the sample. Baseline and endline samples were asked what asset types their families owned (electricity, refrigerator, TV, cow, goat, hen/duck, land, bicycle and motorcycle). The results for both studies showed that most students' families own poultry (hens/ducks), less than a quarter reported owning more expensive assets such as a TV, bicycle or motorcycle.). Around 50% own land, and most own houses made of mud or bamboo (versus sturdier materials such as bricks, tin sheets or wood). Interestingly, the results showed a 30% increase from baseline to endline in access to electricity; with around 75% of the total sample reporting having electricity at the endline. This change is due to the expansion of electricity supply in the district since the baseline study was conducted in 2015. Literature review has shown that children from low-SES families are less likely to engage in experiences that promote fundamental reading skills such as phonological awareness and vocabulary (Buckingham et al, 2013).

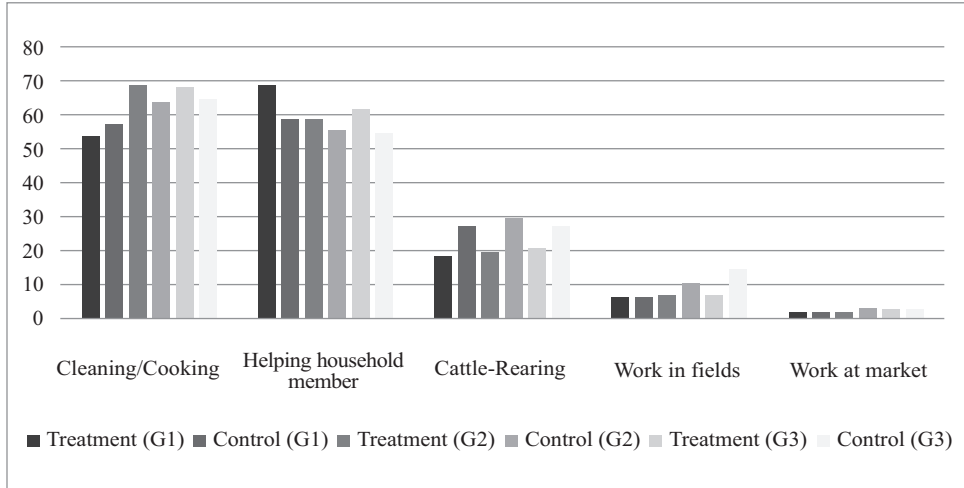
Home Environment

Household Chores

Most students in the sample reported that they assist with cooking and cleaning and helping out with household members at home. As Figure 2 shows, students of all grades in both treatment and control groups reported of doing cooking/cleaning and helping household members (i.e. caring for young children and the elderly). More than half of the children in grades 1 and 2 in both control and treatment groups engaged in household work, whereas this was the case for over two-thirds of the children in grade 3.

⁵ Results were similar for control and treatment groups.

Figure 2: Chore Types by Grade (control vs. Treatment)



Students in all grades in both treatment and control groups are most likely to do approximately 30 minutes of chores in the morning. Evening and weekends are also popular times for doing chores. Afternoons are the least popular chore time presumably because students are attending school during this time. The length of time spent doing chores increases as students grow older. More than 25% of students in grade 3 reported of doing chores for more than an hour compared to both grade 1 and 2 students, both of which groups have less than 10% of students reporting of doing 1 hour or more of chores on weekdays. Around 14% of grade 1 students do chores for more than 1 hour on the weekend while 21% of grade 2 reported doing chores for more than 1 hour on the week-end. These findings are critical to understanding the background factors that can impact academic achievement as studies have shown that too much time spent doing chores is a strong negative predictor of academic achievement (Reich et al, 2013).

Home Literacy Environment

To gain an understanding of student’s home literacy environment, students were asked about their family members’ involvement in reading, helping students to study and reading and telling stories to students.

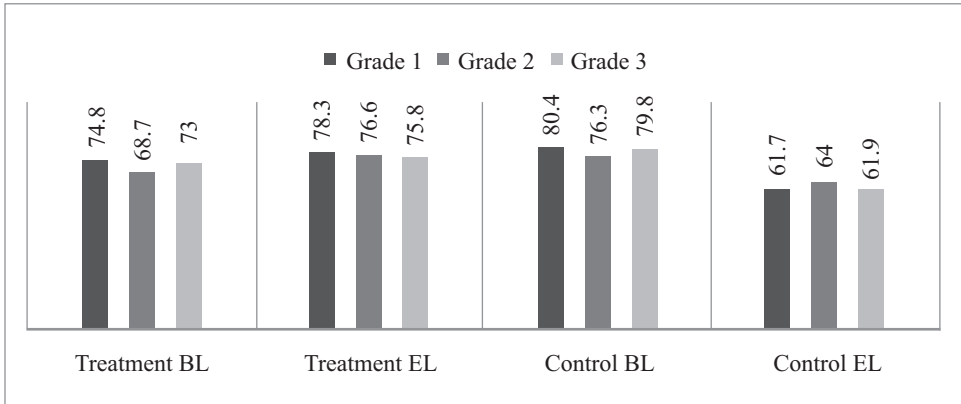
Family Members Reading

Overall, most students in both READ schools and control schools reported seeing family members reading. For treatment groups, there was a slight increase in reported seeing family members read from baseline to endline; however, control groups experienced the

⁶ Data are combined for both treatment and control and only shows endline results as the difference in results reported by students disaggregated by baseline and endline and by treatment and control groups are negligible.

reverse trend—there was a slight decrease in reporting family members reading (Figure 3). There was generally an exposure to reading among some members in the family for around three quarters of the families. Most students in both READ schools and control

Figure 3: Family Members Reading Grade 1-3, Control vs. Treatment



Family Member Involvement with Children in Studying and Reading

schools reported family member involvement in studying and reading. Studies have demonstrated that children who read with parents or other adults tend to have a richer vocabulary than children who do not read with parents/other adults; joint book reading allows children to learn the meaning of new and unfamiliar words through the interaction of reading. Students were asked if family members helped them with their studies. Responses indicated that over 80% of the children in both control and treatment groups had family members who offered some help in their studies (results not shown in this article).

Education History and Situational Factors

Early Childhood Development (ecd), Grade Repetition and Change of School

Nearly 80% of students in grade 1 and 3 reported of attending ECD, generally, the pre-primary class at the endline. This number is strikingly low at roughly 40% for grade 2 students in both treatment and control groups in the endline study (see Table 4 below). In grade 1, grade repetition is low (3% for treatment and 2% for control). Grade 2 and 3 students' results show that less than 15% of them have repeated a grade. More than 30% of students change schools by grade 1 and this number is closer to 50% of students by grade 3. Results are similar for treatment and control groups with treatment groups reporting 5% more students reporting a school change than the control groups. These findings are

Table 4: Education History (endline only)

	Grade 1		Grade 2		Grade 3	
	Treatment	Control	Treatment	Control	Treatment	Control
EcdAttendance	74	81	40	42	77	79
Grade Repetition	3	2	11	11	15	10
Change Of School	32	44	51	40	51	45

particularly important as many studies have shown that ECD attendance has long-lasting, positive effects on academic achievement (Magnuson et al, 2007; Bus et al, 1995).

Closed and Missed School Days

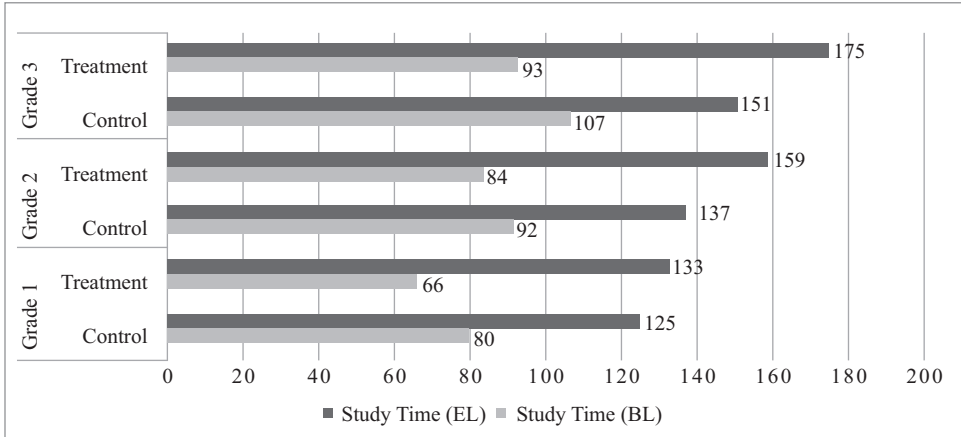
At the endline study, the average number of closed school days reported by all students was 44 days. All students reported an average number of missed days of 2. The top reasons for missing school were due to illness (more than 40% of students reported). Less than 20% of students reported missing school for work, an outing or because they were looking after unwell family members.

Language of Instruction

The language of instruction at school is Bangla for students in both treatment and control groups and the same for baseline and endline. Most students reported that they could comprehend the language of instruction. Roughly 40% of students reported that Chakma was also used in the classroom as a language of instruction (presumably to supplement Bangla instruction). Roughly 15% of students reported the language of instruction as Tripura; less than 5% of students reported Marma as the supplementary language of instruction. These results indicate that teachers may use the student's home language of instruction when necessary (if the teacher speaks the home language) to aid comprehension in the classroom (not shown in this article).

Average Study Time

At the endline, students in READ schools reported studying longer than students in the control schools. This was a clear shift from the baseline in which control groups reported longer study times than the treatment groups. The average study time for students in treatment and control groups in all grades is shown in Figure 4. At the time of the endline study, students in the treatment group studied on average 8 to 24 minutes more per day in different grades than students in the control group.

Figure 4: Average Study Time (in minutes) Grades 1-3, Control vs. Treatment

School Commute

The results from the endline study⁷ show that approximately half of students reported having a school commute of less than 30 minutes. Twenty percent or fewer students reported of a commute of greater than 30 minutes. Many students gave no answer to this question particularly in the lower grades. This lack of response could be because the concept of time for this age group can be abstract and therefore, difficult for them to give a numerical estimate.

Reading Habits

Borrowing a Library Book

Students in the READ schools were more likely to borrow books from the library than students in the control schools. The baseline study showed that less than 3% of students in both treatment and control groups reported borrowing a library book. However, at the time of the endline, the treatment groups reported of a much higher percentage of borrowing a book from the library than at the baseline -- 58% of grade 1 students, 68% of grade 2 students and 71% of grade 3 students reported borrowing a library book (not shown in this paper). On average, only 7% of students in the control group for all 3 grades reported borrowing a library book. These results may indicate that the access to library books that the READ program provided had a positive impact on students' interest in borrowing books.

Activities to Improve Reading Skills

The READ program altered the method of how students improved their reading skills; only students in READ schools (at the endline) reported using decoding to help them improve their reading skills. Students were asked which activities they engaged in to improve their

⁷ Results are from the endline survey only as baseline results showed no significant variation.

reading abilities. The baseline results were similar for all grades and for both treatment and control groups. The baseline results showed that students looked for support from their teachers and family members and used books to improve their reading abilities. Less than 20% of the baseline sample utilized decoding as a method of improving reading skills. The endline study showed similar percentages for both groups in utilizing family members, teachers and textbooks to improve their skills as the baseline study. However, the most dramatic difference reported by students in the treatment group was that they utilized decoding as an activity to improve their skills. On average, 76% of the treatment group (for all 3 grades) reported that they used decoding compared to 56% of the control group students (no shown in this article)

3. Reading Results

In order to determine the effect of the intervention on the treatment groups, the following statistical regression model was used:

$$Y = a + b*T + c*t + d*T*t + e*X1 + f*X2 + \dots + \text{constant}$$

In this formula, Y is the outcome of interest (letter knowledge, most used words, similar beginning sounds, rhyming words, reader, comprehension, fluency, accuracy). The coefficients that were estimated by the regression model are a, b, c, d, e, f. T is the dummy variable (T1 for treatment and T0 for control, t = time dummy, t = 1 for endline, t = 0 baseline), X1, X2, X3 are control variables (age, SES, reading environment, etc.) The value of 'd' is the average treatment effect on the treated group; in other words, 'd' is the effect of the intervention on the treated group.

Emerging Literacy Skills

Emerging, or low order, literacy skills refer to the foundational skills that students need to learn to be able to read, including the ability to identify the letters in the alphabet, the ability to identify written words they use on a regular basis, the phonemes that compose a word, and their knowledge of vocabulary words and antonyms. The following section explores the control and treatment group results on tasks that assess these skills.

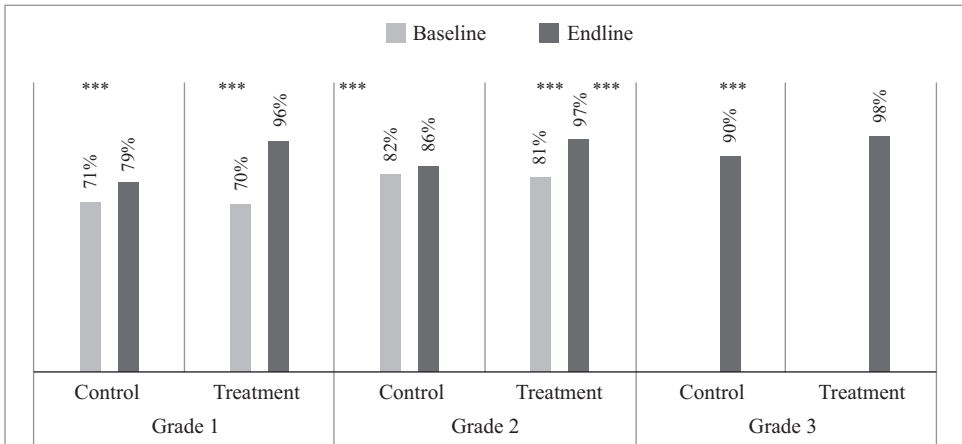
Letter Knowledge

Students in READ schools scored higher on the letter knowledge task than students in control schools at the endline and the differences were significant. Students' ability to correctly identify the number of Bangla letters was assessed for all grades. Figure 5 below shows the increase in scores for grades 1 and 2 for both treatment and control groups. This task was only given to grade 3 students at the endline; thus, there is no comparison data. In the endline, grade 3 students in the control group achieved 90% accuracy in identifying letters compared to grade 3 treatment group students who scored 98% correctly on the task.

In the baseline study, grade 1 students in the control group scored 71% correctly while the grade 1 treatment group scored 79% correctly on the same task; in the endline, grade 1 students in the control group scored 70%--showing almost no improvement. However, grade 1 students in the treatment group scored 96%--demonstrating a huge increase in ability to

identify letters. In the baseline study, grade 2 students in the control and treatment groups scored 82% and 81% respectively. In the endline, the grade 2 control group scored 86% correctly while the grade 2 treatment group scored 97% in identifying letters correctly. The increase that grade 1 and 2 treatment groups demonstrated on this task is promising in terms of early grade literacy development; early mastery of this skill will aid students in becoming proficient and fluent readers.

Figure 5: Percentage of Letters Identified Correctly (grades 1-3) Treatment vs. Control



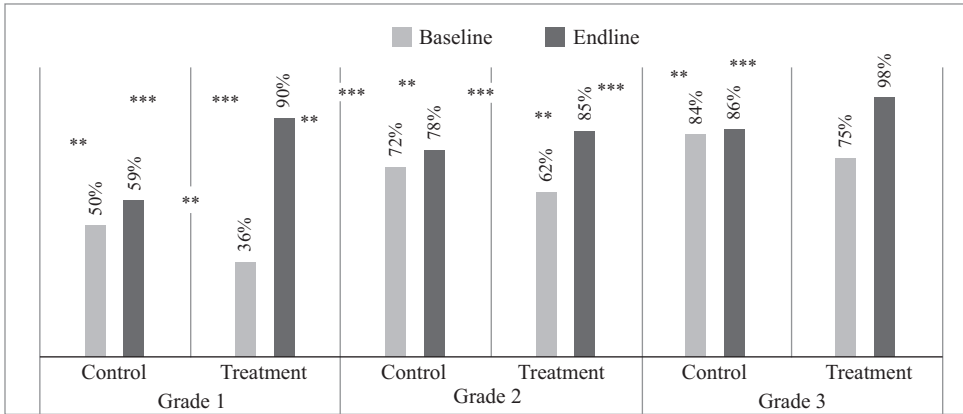
Coefficients are significant $p < 0.001$ (***)

Frequent Words

Students in READ schools scored better on the frequent words task than students in control schools at the endline and the differences were significant. Students’ ability to read out most frequently used words was assessed for all grades. Figure 6 below shows the increase in scores for all grades by treatment and control group. For grade 1 students in the control group, scores increased from 50% correct in the baseline to 59% in the endline. For the grade 1 treatment group, scores increased from 36% correct in the baseline to 90% correct in the endline. From grade 2 students in the control group, scores increased from 72% in the baseline to 78% correct in the endline. For grade 2 students in the treatment group, scores increased from 62% correct in the baseline to 85% correct in the endline. For grade 3 students in the control group, scores increased from 84% correct in the baseline to 86% correct in the endline. For grade 3 students in the treatment group, scores increased from 75% correct in the baseline to 98% correct in the endline.

These results show marginal improvements for the control group from baseline to endline, but show large improvements for all grades in the treatment group. The largest percentage increase (54% from baseline to endline) for the grade 1 treatment group demonstrates that the READ program has a positive impact on literacy in a short amount of time. These results are also statistically significant (see Table 5 below). Since the goal of READ is to address the early grade literacy crisis, these results are particularly promising.

Figure 6: Percentage of Frequent Words Correct (grades 1-3) Treatment vs. Control



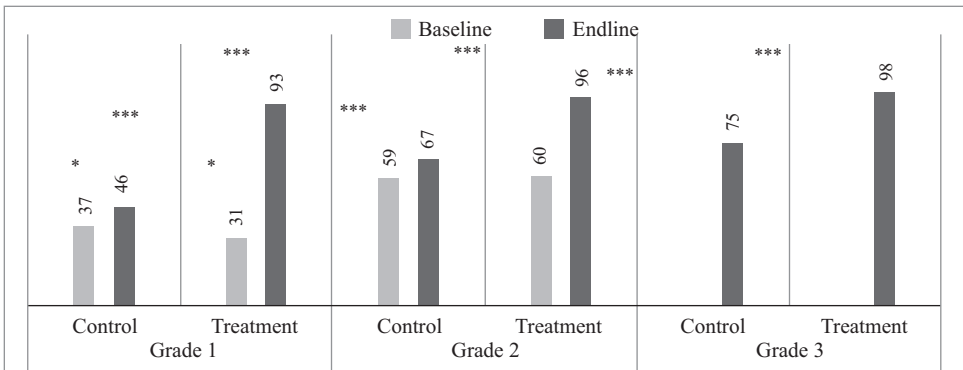
Coefficients are significant $p < 0.01$ (**) and $p < 0.001$ (***).

Similar Beginning Words

Students in READ schools scored higher on the similar beginning words task at the endline than students in control schools and the differences were significant. A total of 10 sets of similar beginning words were provided to the students. Grade 1 students in control and treatment groups recognized a similar percentage of words (37% and 31%, respectively) in the baseline study. In the endline study, the control group recognized 46% of words, while the treatment group recognized 93% of words (see Figure 7).

Grade 2 students in both control and treatment groups started off with similar scores at the time of the baseline study (59% and 60%, respectively). In the endline, the control group recognized 67% of words while the treatment group recognized 96% of words. In the endline study for grade 3 students in both groups, there was a 23% difference in scores between the control and treatment groups with the treatment group scoring higher.

Figure 7: Percentage of Similar Beginning Words Correct for all Grades, Control vs. Treatment

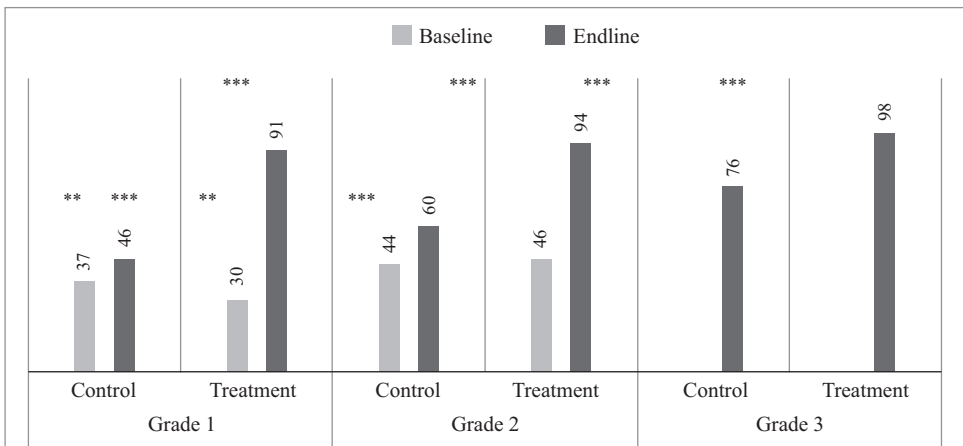


Coefficients are significant at $p < 0.05$ (*), and $p < 0.001$ (***).

Rhyming Words

Students in READ schools scored higher on the rhyming words task at the endline than students in control schools and the differences were significant. A total of 10 sets of rhyming words were provided to the students. In grade 1, both control and treatment groups scored similarly in the baseline (37% and 30%, respectively). However, in the endline, the grade 1 control group scored 46% of rhyming words correctly while the grade 1 treatment group scored 91% rhyming words correctly. Grade 2 students achieved similar results; control and treatment groups started with 44% and 46% correctly in the baseline and, in the endline, the control group scored 60% correct while the endline scored 94% correctly. Grade 3 control group scored 76% correctly in the endline while the treatment groups scored 98% correctly. The treatment groups scored better than the control group for all three grades (see Figure 8).

Figure 8: Percentage of Rhyming Words Correct for all Grades, Treatment vs. Control

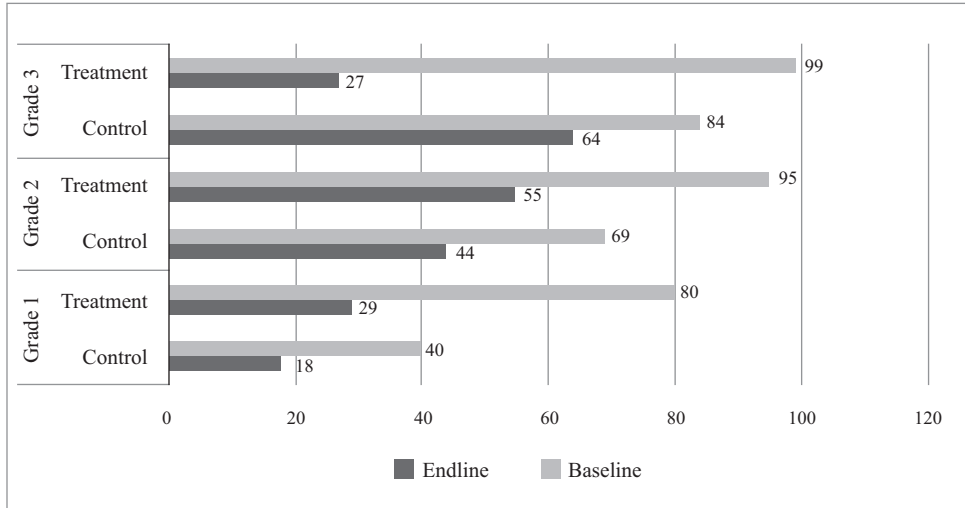


Coefficients are significant at $p < 0.01$ (**) and $p < 0.001$ (***).

Reader vs Non-reader

There were more readers in READ schools than in control schools at the Endline. A reader is defined as a child who can read the oral reading passage independently, which is measured by the ability to read at least 5 words correctly in the first 30 seconds of the sub-test. Readers were allowed to continue reading until they finished the passage or refused to read any further; non-readers were stopped and read the passage by the assessor. At the endline, nearly 40% of grade 1 students in the control group are readers while the grade 1 treatment group consists of 80% readers. In the control group, 69% of grade 2 students are readers compared to 95% of grade 2 students in the treatment group at the time of the endline. For grade 3 students, 84% of the control group students are readers compared to 99% of grade 3 students in the treatment group. Figure 9 below shows the percentage of readers in both control and treatment groups at the time of the baseline and the endline for students in all grades.

Figure 9: Percentages of Readers in all Grades, Treatment vs. Control



Emerging Literacy Skills Difference -- Means for Control and Treatment Groups

Table 5 below shows the statistical significance in difference between means for the control and treatment groups for each grade at the baseline and endline for emerging literacy skill tasks. The baseline results show that, for the most part, there was no statistical significance between the means for emerging literacy skills of the control and treatment groups with a few exceptions in which the control group performed better than the treatment groups. The endline results show that the treatment groups scored better than the control group on all emerging literacy skills tasks at a significance level of $p < 0.001$. Treatment groups scored 90% or more for all emerging literacy skill tasks in all grades with grade 3 students performing the best (98% for all 4 tasks). It is also important to note that the increases that were seen in the control group from baseline to endline were statistically significant (See Annex B for detailed table); increases were anticipated as the endline study was conducted at the end of the academic year; and thus, reading skills would have improved as a result of school attendance and student maturation throughout the school year. However, further research is warranted to explore these interesting trends.

Table 5: Grade 1-3 Emerging Literacy Skills: Difference between Means Control vs. Treatment

Grade 1		Baseline				Endline			
Variable Name	T	C	p-value	SS	T	C	p-value	SS	
Letter knowledge	70	71	0.068	710	96	79	0.00***	690	
Most frequent words	36	50	<0.01**	710	90	59	0.00***	690	
Similar beginning words	31	37	<0.05*	698	96	46	0.00***	689	
Rhyming words	30	37	<0.01**	710	91	46	0.00***	690	
Grade 2		Baseline				Endline			
Variable Name	T	C	p-value	SS	T	C	p-value	SS	
Letter knowledge	81	82	0.49	698	97	86	0.00***	689	
Most frequent words	62	72	<0.01**	698	85	78	0.00***	689	
Similar beginning words	60	59	0.82	698	96	67	0.00***	689	
Rhyming words	46	4%	0.43	698	94	60	0.00***	689	
Grade 3		Baseline				Endline			
Variable Name	T	C	p-value	SS	T	C	p-value	SS	
Letter knowledge	-	-	-	-	98	90	0.00***	706	
Most frequent words	75	84	<0.01**	704	98	86	0.00***	706	
Similar beginning words	-	-	-	-	98	75	0.00***	706	
Rhyming words	-	-	-	-	98	76	0.00***	706	

Coefficients are significant at $p < 0.05$ (*), $p < 0.01$ (**) and $p < 0.001$ (***).

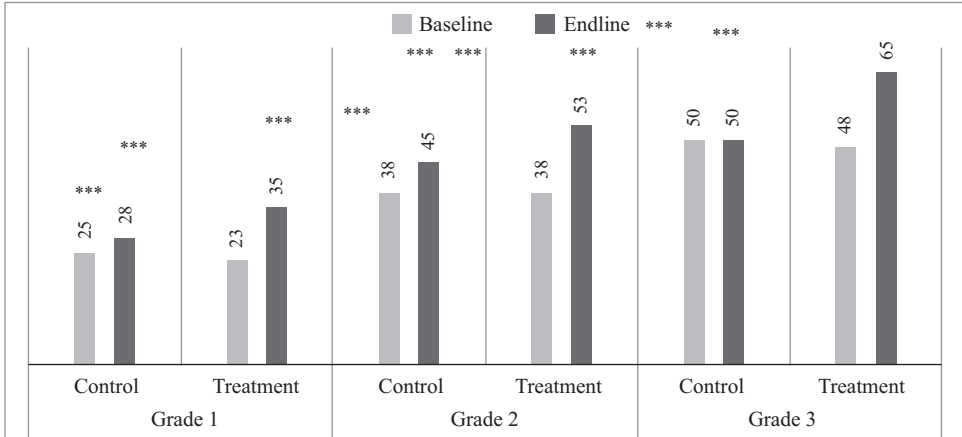
Higher Order Literacy Skills

Higher order literacy skills are the skills that students develop once they are independent readers (able to decode at least 5 words in the first 30 seconds of attempting to read a passage), such as the ability to read with fluency, accuracy, and comprehension. The following sections explore the control and treatment group results on tasks that assess these skills.

Fluency

Fluency rates were higher for students in READ schools than those in control groups, but fluency rates for all students were low. For measuring reading fluency, number of words read correctly per minute was calculated among the readers. Figure 10 below shows the fluency scores for control and treatment groups. In all grades, the endline scores of the treatment groups were higher than the endline scores of the control groups. It should be noted, however, that fluency scores are still quite low even for the treatment groups. These results are particularly disconcerting result as research has shown that fluency and comprehension are correlated; thus, to improve reading comprehension abilities, concentrated efforts need to target strategies that improves students' overall fluency.

Figure 10: Fluency Scores (Words per minute) Grades 1-3, Treatment vs. Control

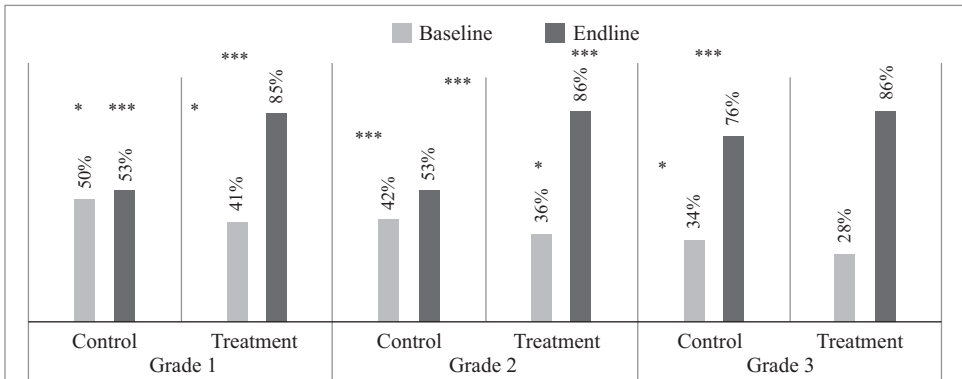


Coefficients are significant at $p < 0.001$ (***)

Reading Comprehension

Students in READ schools scored better in reading comprehension than students in control schools at the endline and the differences were significant. For measuring reading comprehension, the percentage of correct answers from the comprehension was calculated (out of 10 questions) among the readers. Figure 11 below shows the reading comprehension scores for readers in the control and treatment groups for all grades. In all grades, the endline scores of the treatment groups scored better than the endline scores of the control groups. While baseline scores amongst control and treatment groups show similar results, the endline scores show vast improvements for students in the treatment groups compared to the baseline results. The treatment group showed increases from baseline to endline; grade 1 students’ scores increased by 32%; grade 2 students’ scores increased by 33% and grade 3 students’ scores increased by 58%.

Figure 11: Comprehension Scores of Readers, Grades 1-3, Control vs. Treatment



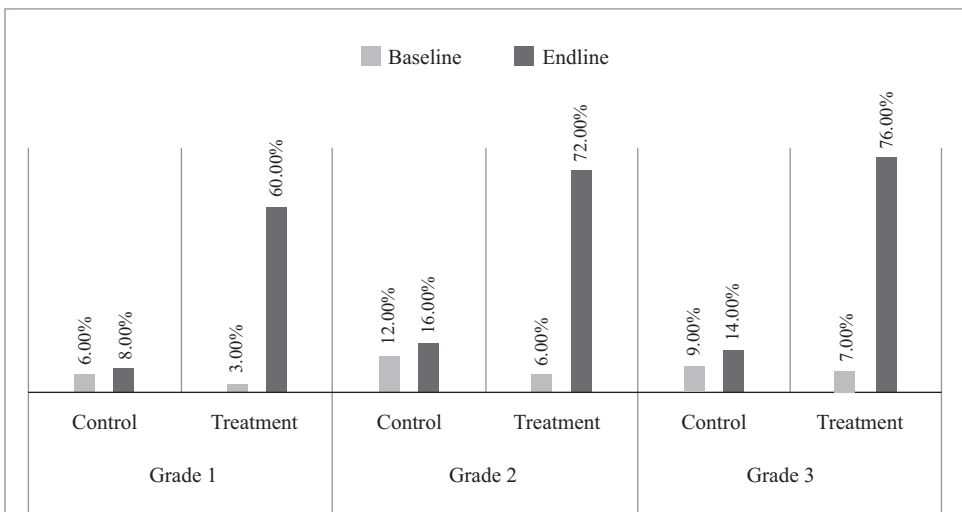
Coefficients are significant at $p < 0.05$ (*), and $p < 0.001$ (***)

Readers with Comprehension

Students in READ schools were more likely to be readers with comprehension than students in control schools. Comparisons were also made between three groups; non-readers, readers who can read less than 80% of the comprehension task correctly and readers who answered at least 80% of the comprehension correctly. Figure 12 shows the difference between control and treatment groups for all grades for those who could answer 80% or more of the questions correctly. The results show the considerable impact of the READ program on the treatment group.

The percentage of grade 1 students in the treatment group who could read with comprehension increased from 3% to 60% from the baseline to endline compared to the control group which increased from 6% to 8%. The percentage of grade 2 students in the treatment group who could read with comprehensions increased from 6% to 72% from the baseline to endline compared to the control group increase of 12% to 16%. The percentage of grade 3 students in the treatment group who could read with comprehension increased from 7% to 76% from the baseline to endline compared to the control group increase of 9% to 14%. The results demonstrate that in addition to having a positive and significant impact on lower order reading skills, the READ program has also had a substantial impact on improving higher order thinking skills. At the endline, there were 7 times more grade 1 students in the treatment group who could read with comprehension, more than 4 times the number of grade 2 students in the treatment group who could read with comprehension and more than 5 times the amount of grade 3 students in the treatment group who could read with comprehension.

Figure 12: Readers with Comprehension, Grades 1-3, Treatment vs. Control



Higher Order Literacy Skills Difference -- Means for Control and Treatment Groups

Table 6 shows the significance in difference between means for the control and treatment groups for each grade at the baseline and endline studies for higher order literacy skill tasks. The baseline results for each skill show similar percentages for both control and treatment groups with a few exceptions in which the control group scored better than the treatment group (grade 1 incomprehension, grade 2 in accuracy, and grade 3 in comprehension). These differences may have randomly occurred as they are not consistent with the other higher order literacy skill results in their respective grades. In the endline study, when controlling for background characteristics, treatment groups in all three grades scored better the control groups for all higher order literacy skill tasks (accuracy, fluency and comprehension with a significance of $p < 0.001$). The results show that while accuracy scores for all grades neared 100% for all three grades, and comprehension scores were 85% and above for all three grades, fluency scores were much lower for all grades.

Table 6: Grade 1-3 Higher Order Literacy: Difference between Means Control vs. Treatment

Grade 1		Baseline				Endline			
Variable Name	T	C	p-value	SS	T	C	p-value	SS	
Accuracy (% correct)	77	85	0.053	167	99	92	0.00***	410	
Fluency (in wpm)	23	22	0.16	152	35	28	0.00***	410	
Comprehension (% correct)	41	50	<0.05*	167	85	53	0.00***	410	
Grade 1		Baseline				Endline			
Variable Name	T	C	p-value	SS	T	C	p-value	SS	
Accuracy (% correct)	84	89	<0.05*	348	97	92	0.00***	564	
Fluency (in wpm)	38	38	0.91	335	53	45	0.00***	564	
Comprehension (% correct)	36	42	0.43	349	86	53	0.00***	564	
Grade 1		Baseline				Endline			
Variable Name	T	C	p-value	SS	T	C	p-value	SS	
Accuracy (% correct)	89	90	0.68	485	99	91	0.00***	645	
Fluency (in wpm)	48	50	0.43	467	65	50	0.00***	645	
Comprehension (% correct)	28	34	<0.05*	485	86	76	0.00***	645	

Coefficients are significant at $p < 0.05$ (*) and $p < 0.001$ (***).

Again, it is also important to note that the increases that were seen in the control group results from baseline to endline were statistically significant (See Annex B for detailed table); increases were anticipated as the endline study was conducted at the end of the academic year; and thus, reading skills would have improved as a result of school attendance for the school year. However, further research is warranted to explore these interesting trends.

Correlations between Reading Skills and Behavior and Literacy Outcomes

Using the Pearson's r to determine correlation, relationships between reading skills and behavior and literacy outcomes were identified. Table 7 below shows the correlation coefficients and levels of significance for the relationship between fluency and comprehensions as well as the relationship between borrowing books and reading comprehension. The relationship between fluency and comprehension shows a weak positive relationship for all grades for both treatment and control groups for both the baseline and endline studies. All the correlations for fluency and comprehension are statistically significant except for the grade 1 control group at the endline. These results are expected as research has demonstrated a link between fluency and comprehension; proficient reading fluency frees cognitive resources to enhance overall comprehension of reading texts (LaBerge and Samuels, 1974).

In regard to borrowing books and comprehension, there is no correlation to be found for grade 1 at either the baseline or endline for either group. The grade 2 results show that there is no correlation between borrowing books and comprehension except for the control group at the endline which shows a weak positive relationship that is statistically significant. For grade 3, there is a weak positive relationship that is statistically significant for both treatment and control groups at the endline; in addition, the grade 3 control group shows a very weak positive and significant relationship at the baseline. As seen in the previous chapter, of all students who borrowed books, grade 3 students were most likely to read the borrowed book which may explain why there were statistically significant results for this group. There were no correlations between grade 1 and 2 students' borrowing books and comprehension likely because mere possession of a book does not lead to literacy skills improvement.

Table 7: Correlations between Fluency/borrowing Books and Comprehension

	Grade 1		Grade 2		Grade 3							
	Baseline	Endline	Baseline	Endline	Baseline	Endline						
	Treatment	Control	Treatment	Control	Treatment	Control						
Fluency and Comprehension	0.4**	0.2 *	0.2**	0.2	0.4**	0.3**	0.4**	0.3**	0.3**	0.3**	0.2**	0.3**
Borrowing books and Comprehension	0.1	0.0	0.1	0.2	0.0	0.0	0.1	0.3**	0.0	0.1*	0.2**	0.2**

Coefficients are significant at $p < 0.05$ (*), and $p < 0.01$ (**).

Background Variables and Literacy Outcomes

Using the coefficients from the multi-level regression models, relationships between reading skills subtests and students’ background information were identified. The table below (Table 8) presents these findings. These results demonstrate that students with a weak home literacy environment (defined by noticing fewer than 3 family members read) showed significant differences ($p < 0.001$) in a multitude of emerging literacy and higher order literacy skills in all three grades. For grade 1 and 2 students, there were significant differences between the scores of students with a strong home literacy environment and a weak home literacy environment similar beginning words and most frequent words. For grade 2 and 3 students, those with a strong home literacy environment scored better than those students with a weak literacy environment on the reading comprehension task. These findings, confirmed by a research study, suggest strong home literacy environments are a good predictor of literacy skills and vocabulary development (Sénéchal and LeFevre, 2002).

Students with no early childhood development(ECD) opportunities performed worse on several lower order literacy skills in grade 1, but by grade 2, there were no major significant differences and by grade 3, students who attended ECD and those who did not attend ECD showed no differences overall. Lastly, the results of the endline showed no significant gaps in literacy achievement between students of high and low SES or according to gender. This may be an indication that previous government and donor-led initiatives to address these issues have helped reduced inequalities in these two areas.

Table 8: Difference in Literacy Outcomes by Background Variables

	Socio-economic Status	Home Literacy Environment	Previous Ecd Attendance
Grade 1			
Similar beginning words	-	Weak home literacy ***	No ECD**
Most frequent words	-	Weak home literacy ***	-
Rhyming words	-	Weak home literacy ***	No ECD**
Letter knowledge	-	-	No ECD**
Accuracy	Low SES*	-	-
Grade 2			
Similar beginning words	-	Weak home literacy ***	No ECD**
Most frequent words	-	Weak home literacy ***	-
Accuracy	-	Weak home literacy **	-
Reading Comprehension	Low SES***	Weak home literacy ***	-
Grade 3			
Accuracy	-	Weak home literacy ***	-
Fluency	-	-	-
Reading Comprehension	-	Weak home literacy ***	-

Coefficients are significant at $p < 0.05$ (*), $p < 0.01$ (**) and $p < 0.001$ (***). A dash indicates no significant difference.

The baseline study results found that Tripura-speaking students performed worse than their peers, although these differences diminished slightly among third grade students. Marma-speakers, meanwhile, were the highest performing students, but again, these differences were most pronounced among grade 1 and grade 2 students. The endline study confirmed the baseline results in that Marma-speakers scored highest for both higher order and lower order literacy skills in both treatment and control groups for the 3 grades. These results suggest that more research is needed into understanding why Marma-speaking students are scoring better than students who speak the other languages.

4. Conclusions and Recommendations

This section provides a recapitulation of the findings presented in the previous two chapters and the conclusions derived from them. It also presents recommendations for further analysis and action.

Conclusions

The key findings and conclusions are presented below under the headings of “student and school characteristics,” “students’ study habits” and “students’ reading skills achievement” for treatment and control groups.

Students and School Characteristics

- Almost 100% of students report understanding the language of instruction (Bangla) even though most students in the three grades (both control and treatment groups) surveyed in both the baseline and the endline speak either Chakma or Tripura at home. Even though the majority language of instruction reported is Bangla, students also reported that ethnic languages are also used (mainly Chakma) to some extent to support instruction.
- There were no overall difference in achievement between students who attended preschool and student who had not attended preschool. Students who had not attended preschool performed worse on several lower order literacy skills in grade 1, but by grade 2, there were no major significant differences and by grade 3, students who had attended preschool and those who had not showed no difference in overall achievement.
- There were no significant gaps in literacy achievement by gender or between students of high and low SES at the endline. This may be an indication that previous government and donor-led initiatives to address these issues have helped reduce inequalities in these two areas.

Students’ Study Habits

- Students at READ schools reported studying longer. In the endline⁸, students of all grades report studying at home for over 2 hours per day; while grade 3 students in READ schools reported studying for almost 3 hours per day (175 minutes).

⁸ Average study time data was only collected at the endline.

- Students at READ schools are more likely to borrow books from the library⁹. The baseline study found that less than 3% of students in both groups in all 3 grades reported borrowing a book from the library. Treatment groups experienced dramatic increases in book borrowing behavior in the endline with 58% of grade 1 students, 68% of grade 2 students and 71% of grade 3 students reporting borrowing a library book. On average, at endline, only 7% of students in the control group for all 3 grades report borrowing a library book. While this is promising, very few students from both control and treatment groups actually read the borrowed books.
- Students at READ schools were more likely to read with peers. The baseline found that 27% of Grade 1 students, 23% of grade 2 students and 27% of grade 3 students in both groups reported reading with peers. The endline study found that 30% of grade 1 treatment group students reported reading with peers compared to 10% of grade 1 control group students; 37% of grade 2 treatment group students reported reading with peers compared to 16% of grade 2 control group students; and 35% of grade 3 treatment group students reported reading with peers compared to 17% of grade 3 control group students.
- The READ program influenced the method of how treatment group students improved their reading skills. Most students in both treatment and control schools used the help of teachers, family and textbooks to improve their reading skills at the time of the baseline. Over 75% of the students in the treatment group reported using decoding to improve their skills (compared to less than 20% for both groups at the baseline). The use of decoding to improve reading skills was reported by roughly 56% of the control group students for all 3 grades at the endline. These results indicate that the READ program may have helped transition students into being autonomous and self-directed learners.

Students' Reading Achievement

- Students at READ schools scored better on emerging literacy skill tasks (letter knowledge, and reading most frequent words, similar beginning words and rhyming words) at a significance level of $p < 0.001$. Treatment groups scored 90% or more for all emerging literacy skill tasks in all grades. In the endline, control groups scored, on average, 79%, 86% and 90% for grades 1, 2 and 3 respectively for letter knowledge; 59%, 78% and 86% for the 3 grades respectively on frequent words; 46%, 67% and 75% for the 3 grades respectively on similar beginning words; and 46%, 60% and 76% for the 3 grades respectively on rhyming words. Importantly, proficiency in emerging literacy skills is critical for students in early grades to become independent readers and has been shown to positively impact mathematical literacy, thus leading to better overall education success throughout the course of a student's school life.
- Students at READ schools scored better on higher order literacy skill tasks (accuracy, fluency and comprehension) with a significance of $p < 0.001$. Higher order thinking skills are critical for success in other academic subjects and these results indicate that the

⁹ Students were asked if they had borrowed a book from a library and if they responded yes, they had the option to select which type of library from the following 5 options: school library, CRC, government library, community mobile library or other.

impact of the READ program may indirectly impact other educational outcomes in a student's academic trajectory.

- Students at READ schools were more likely to be Readers with Comprehension (defined as readers who answered at least 80% of the comprehension task correctly). At the endline, control group results showed that there were 8%, 16% and 14% of readers with comprehensions in each of the 3 grades respectively at the endline; while treatment groups showed 60%, 72% and 76% of readers with comprehension respectively in each grade. These results hint at the positive impact that the READ program has had on improving higher order thinking skills in students of all grades.
- Students who have a strong home literacy environment (defined as noticing more than 3 family members reading) are more likely to be strong readers. For grade 1 and 2 students, there were significant differences between the scores of students with a strong home literacy environment and a weak home literacy environment similar beginning words and most frequent words. For grade 2 and 3 students, those with a strong home literacy environment scored better than those students with a weak literacy environment on the reading comprehension task. These findings confirm research studies that show that a strong home literacy environment is a good predictor of literacy development (Sénéchal and LeFevre, 2002)).
- Although students' fluency increases from grade to grade, fluency is a challenge for students at both READ schools and control group schools. However, treatment groups had higher scores than the control groups in the endline. Endline scores for grade 1 were 28 wpm for the control group and 30 wpm for the treatment group. For grade 2, scores were 45 wpm for the control group and 53 wpm for the treatment group at the endline. For grade 3, scores were 48 wpm for the control group and 65 wpm for the treatment group at the endline. In general, these results are somewhat discouraging as research has shown that fluency and comprehension are correlated; and to improve reading comprehension, concentrated efforts are needed to improve students' overall fluency.

Recommendations

- Innovate programming to improve the home literacy environment. In order to improve literacy outcomes for students who have a weak home literacy environment, it is necessary to create new ways to encourage reading at home for this population of students. Literacy rich home environments, in which parents engage in reading and sharing books with children, can override some of the educational disadvantages that lower-income families often face (Purcell-Gates, 1996). This may also increase the number of students who borrow books from a library and actually read the borrowed books at home.
- Innovate programming that gives parents the tools needed to engage in greater depth with their child's education. Both the baseline and endline studies showed that more than 80% of parents in the Khagrachari District aid their children in reading and studying. Given this high level of parental interest, it might be worthwhile to explore interventions that provide tips and activities for parents on how to help children read

better. A recent study in the United States has shown that nudging parents through text messages that give reading tips, goals, activities and games to use with their children has led to an increase in joint reading time which can improve a child's academic performance (Mayer et al, 2015).

- Conduct research on how the first language is used in the classroom to support literacy and language acquisition in Bangla. Consider incorporating second language pedagogy into READ programs that function in a multilingual context to enhance literacy outcomes in all languages.
- Explore a greater variety of classroom interventions that can improve fluency in reading. Administering individualized diagnostic reading assessments to students could help teachers understand how to target problem areas for students. Teacher training that focuses on methods to improve students' reading fluency may also be helpful. Increasing the opportunities for students to practice using reading skills, particularly fluency strategies, both in the classroom and in the outside world can lead to improved literacy outcomes.

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