

Play, Connect and Learn: Using Mobile Phones to Improve Early Grade Reading Skills at Home

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ABSTRACT

Mobile technologies offer great scope and potential for learning in countries with moderate income rates, low literacy levels, poor educational opportunities and high ownership of mobile phones. The paper discusses the efforts made by Sesame Workshop in India to support children's grade 1 and 2 reading skills, specifically foundational literacy and reading comprehension, using mobile phones at home. It provides the findings from a quasi-experimental design research conducted to evaluate the effectiveness of a mobile phone based reading application on the reading levels of children. A total of 627 children participated in the research, which used an adapted version of Early Grade Reading Assessment (EGRA) to measure children's early grade reading skills, in their mother tongue. The findings indicate statistically significant gains for children in the intervention group on four of the six subtasks: letter name identification, syllable identification, familiar word reading and oral reading fluency. These findings support the growing literature on the effectiveness of engaging and developmentally appropriate content delivered through mobile phones to improve children's reading skills.

Keywords: Mobile phones, Mobile learning, Early grade reading, EGRA

1. INTRODUCTION

The education system for a majority of the children in the developing countries is marked by many challenges, which affects the quality of teaching and learning (Bahamondez, E et. al, 2011). In India, the government's emphasis on universal enrolment has resulted in almost all children attending schools, but the quality of education delivered has remained low, especially for the disadvantaged population. Poor infrastructure in schools, high teacher-child ratio, multi-grade classrooms, lack of good quality learning resources and untrained teachers affect the academic performance of children especially their early grade reading skills and mathematical abilities. The Annual Status of nationwide survey of reading skills among primary school children in rural India shows that, in 2016, almost half of the children surveyed (46%) cannot even identify letters in Grade 1 (ASER, 2016). This initial gap in learning sustains and widens with progression, and children in the higher grades cannot even complete the tasks for lower grades. The ASER survey findings from the same year indicate that only half of grade 5 children could fluently read text at the level of the grade 2 syllabus. These statistics are alarming and reflect a great need to identify alternate ways to enable learning for all children

The last few years have seen a growing recognition of the role of technology to enhance the learning environment of children. The use of information and communication technologies (ICT) to empower teachers and transform the teaching and learning process has grown steadily, with the use of smartboards, computers and tablets in schools or at home. There is a growing penetration of mobile phones in South Asia, a trend driven by high purchasing power of people, low pricing for mobile phones and better internet connectivity (UNESCO, 2012). The

affordability and accessibility of mobile phones in developing countries offer unique possibilities for supplementing and enriching education for children, especially those who lack access to high quality books or reading materials (Sung, Y et. al, 2016).

In India, most mobile based educational efforts in the past have centred around providing educational programs and resources to adults who cannot read. The Mobile and Immersive Learning for Literacy in Emerging Economies (MILLEE) project in India, is a relatively new research based initiative that investigates how mobile phones can be used to enhance English language skills in low income students in rural India. The impact evaluation of their mobile based program showed that children who participated in the afterschool program had significant learning gains in recall of English words and phrases (Kam et. al, 2009). However the project mostly targeted children who were mostly from Grade 6. Based on the review of existing literature and as noted by Valk in his paper 'Using mobile phone to improve educational outcomes', it can be concluded that the evidence on the effectiveness of mobile based interventions for learning among young children is nascent and limited (Valk et, al, 2010).

This paper presents the findings from the research conducted by School to School International (STS) on the effectiveness of a mobile phone based reading application on children's early grade reading skills. As a part of its 'Play, Connect, Learn' (PCL) project, Sesame Workshop India developed a self-paced reading application for children with audio story books, games and inbuilt assessments in their native language. The application, developed with the support from a Marathi language expert, was installed in the mobile phones of 12,000 families in six districts (*Amravati, Buldhana, Chandrapur, Kolhapur, Sangli and Yavatmal*) of the state of Maharashtra. This reading application was developed to serve as a supplementary learning tool for children, who otherwise attend low resourced government schools and have limited access to reading materials at home.

About the Reading Application: The Play. Connect. Learn reading application was designed to provide leveled reading experiences to children at home through the mobile phones. It included three separate leveled reading packages with a suite of audio story books, games and inbuilt assessments to track children's progress over time. Each reading package had four audio story books along with memory and comprehension based games. To avoid children from randomly switching from one story book to the next, the team developed the game design in a way that a child could progress to the next audio story book only by scoring at least 70 percent on the comprehension game. A score of less than 70 meant that the child had to re-read the book and attempt the comprehension game again.

SWI partnered and trained local NGO members on how to install the application on the mobile phones of families and to build the capacity of the parents to use it with children at home. As the application required a smartphone with certain technological capacities, SWI had to distribute smartphones to families who did not have access to the required technology.

Further, in the absence of sustained internet connectivity, the families could not download the reading application. The NGO members made physical visits to almost all the households to install each reading package on their smartphones and train them on ways to engage in shared reading activities with their children. Each reading package was used by families for approximately 3 months before the next package was installed.

School to School International conducted the evaluation research to assess whether access to appropriate content delivered through mobile phones at home, improved the early grade reading skills of children, compared to those who did not receive the content. Semi-structured end of the project (EOP) interviews were also conducted to understand and document the lessons learnt to inform the potential scalability of the project.

2. METHOD

A quasi-experimental design study with a matched control group was conducted to assess the impact of the intervention. Within each target district, geographically close villages were grouped into clusters, and were randomly assigned into intervention or comparison groups. This ensured that the villages were not close to each other, thus minimizing the effect of contamination. In both the groups, families with children in Grades 1 and 2 were randomly selected, until each district's required sample size was reached. A total of 627 children participated in the research study, of these 313 were in the intervention group and 314 in the comparison group. The baseline data was collected in June and August 2016, and the endline data was collected between April to June 2017.

Table 1: Sample Characteristics

Category	Number of children		
	Intervention	Comparison	Total
Boys	162	156	318
Girls	151	158	309
Grade 1	156	141	297
Grade 2	157	173	330
Total	313	314	627

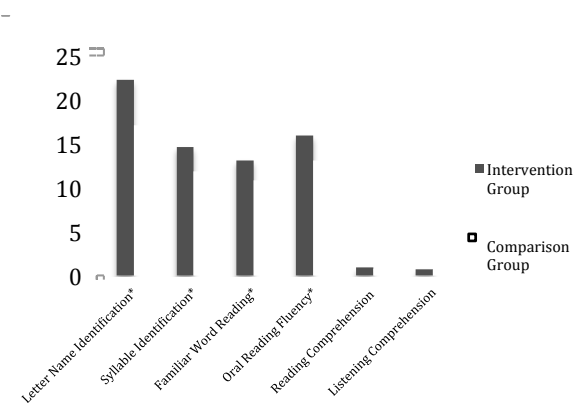
The study used the adapted version of the Early Grade Reading Assessment (EGRA) tool, customized in the Marathi language, to measure children's reading abilities, comprehension and fluency in their mother tongue. Trained researchers administered EGRA at baseline and end-line in both intervention and comparison groups to assess any improvement on children's foundation reading skills. Gain scores were computed as the difference between endline and baseline for each subtask, and student reading performance was calculated comparing gain scores for students in the intervention group to gain scores for students in the comparison group. Differences in gain scores between the intervention and comparison groups were tested for significance using independent samples t-test analysis.

3. RESULTS

The research study shows that on average, children in the intervention group had statistically significant greater gains from baseline to endline than children in the comparison group on four of the six subtasks: letter name identification, syllable identification, familiar word reading and oral reading fluency,

than children who did not have access to the intervention (Figure 1).

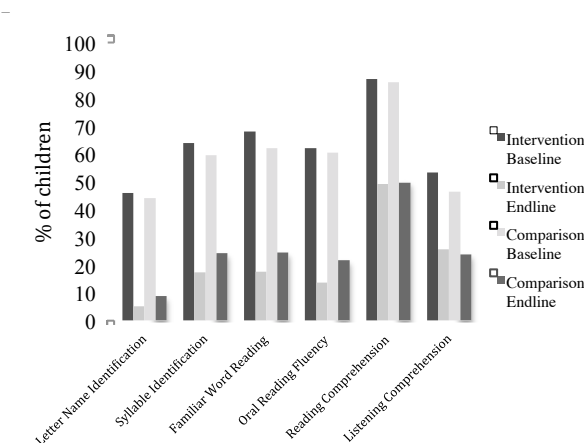
Figure 1: Mean Results by EGRA Subtask and Group at Baseline and Endline



* Indicates the gain scores for the intervention group were significantly higher than the gain scores for the comparison group at $p < 0.05$.

Additionally, the proportion of intervention group children who received zero scores at endline was statistically significantly lower than that of comparison group children on three subtasks: syllable identification, familiar word reading, and Oral reading fluency.

Figure 2: Percentage of children receiving zero score by EGRA subtasks (%)

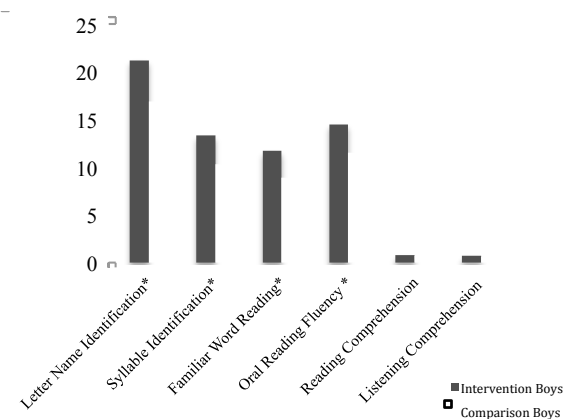


The intervention also benefitted grade 1 and grade 2 children in different ways; grade 1 students in the intervention group made statistically significant greater gains than their peers in the comparison group on the letter name identification subtask whereas the grade 2 students in the intervention group showed statistically significant greater gains than their peers in the comparison group four subtasks: letter name identification, syllable identification, familiar word reading, and oral reading fluency subtasks.

In terms of gender, both boys and girls in the intervention group could benefit, though to varying degrees. The boys in the intervention group had statistically higher gains from baseline to end line over their peers in the comparison group on more subtasks (Figure 3: letter name identification, syllable identification, familiar word reading, oral reading fluency), than did girls in the intervention group over girls in the comparison

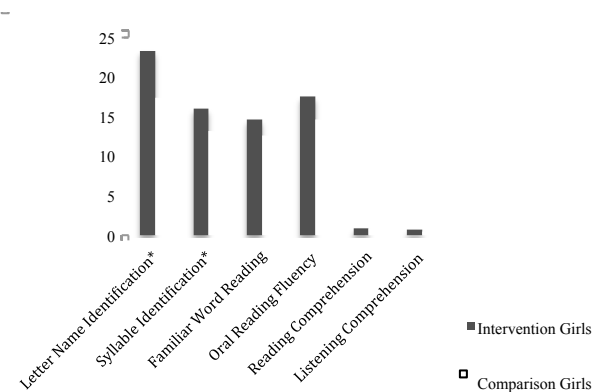
group (Figure 4: letter name identification, syllable identification).

Figure 3: Average gain scores from Baseline to Endline- Boys



* Indicates the gain scores for the intervention group were significantly higher than the gain scores for the comparison group at $p < 0.05$

Figure 4: Average gain scores from Baseline to Endline- Girls



* Indicates the gain scores were significantly higher at $p < 0.05$

Most families in the end of the project (EOP) interviews reported absence of sufficient reading materials for children at home prior to the intervention, and stated their limited role in supporting their children’s education. They acknowledged that the application provided a novel way to engage in reading experiences with their children at home.

4. DISCUSSION

The findings of this research study indicate that engaging, developmentally appropriate and interactive content delivered through mobile phones at home has the potential to improve children’s early grade reading skills. There were many technical challenges in the implementation of the project on ground, like the limited memory of the mobile phones, poor internet connectivity, limited access to smartphones by the children, and lack of reliable back end data to track usage. Despite all this, the ‘Play.Connect.Learn’ application was successful in significantly improving children’s skills on letter name identification, syllable identification, familiar word reading and oral reading fluency. There was no statistically significant difference in the increase in scores on reading comprehension subtasks for

children in the intervention and comparison group. However, these results are promising as reading comprehension is a higher order skill that requires development of other critical skills like phonemic awareness, sight word vocabulary, oral reading fluency. It will be worth exploring how reading comprehension in children can be improved using mobile technology along with support from parents through shared reading experiences.

The project also impacted boys and girls differently. Boys in the treatment group showed statistically higher gains than their peers in comparison group on more subtasks than girls in the two groups. One of the possible reasons could be that the boys had more opportunities to use the mobile phones than the girls. In the absence of reliable data on the time spent by each child, it is not possible to validate this hypothesis for this project. However future interventions should consider ways to ensure equitable access to educational opportunities for both girls and boys in school and at home.

During the monitoring visits, it was observed that the mobile phone was generally with the father and the child could only access it in the morning or when the father was back from work. Also, due to Internet connectivity challenges in the six districts of Maharashtra, it was not possible to capture accurate time spent by each child on the reading application which prevented collection of dosage data for analysis. Further, each content package required significant memory which was generally not available on many phones. Due to this challenge, the previous content packages had to be deleted, which in general limited the children’s exposure time to the full suite of content activities.

Despite all this, the current findings from this research support the growing literature on the potential of mobile phones for improving children’s mother tongue based reading skills in early grades.

5. CONCLUSION

The Play. Connect. Learn project leveraged the availability of mobile phones at home to deliver interactive leveled content to promote reading skills among children in early grades. However due to the wide variation in the type of devices and their functionality, the project team had to distribute smartphones to the families for continuous engagement with the reading application. In future, it will be important to find a solution to this challenge and explore how mobile technologies can be used to address the needs of low resourced communities, in a cost effective and scalable way.

Going forward, any mobile learning based project should try to accurately capture how much time on an average children usually spend with the reading application or if different groups of children (boys versus girls, rural versus urban etc.) use the application differently. The research should capture whether the differential usage has any impact on children’s reading outcomes. Further investigation should also explore parents’ role in supporting reading acquisition skills for young children, especially in promoting reading comprehension. And finally, additional research of the mobile application and the mother tongue based content is required to build a stronger evidence base for the project components and the delivery mechanism.

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