

# Supporting Technology- Based Innovations to Improve Early Grade Reading Outcomes for Students Who Have Low Vision or are Blind

Lessons from Four All Children Reading:  
A Grand Challenge for Development Projects



Prepared by **School-to-School International (STS)**

For **All Children Reading: A Grand Challenge for Development (ACR GCD)**

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# Introduction

Globally, it is estimated that between 93 million and 150 million children have a disability, although, given how limited the data are, the actual number could be even higher.<sup>1</sup> Approximately one child in every ten has a disability, and 80.0 percent of those live in developing countries.<sup>2</sup> It is estimated that 19 million children globally are blind or have low vision.<sup>3</sup> Fewer than 3.0 percent of students with disabilities attend school—girls with disabilities are less likely to attend than boys—and those that do, often lag behind their peers in terms of graduation rates.<sup>4,5</sup>

Many education systems do not sufficiently address or accommodate these children’s learning needs. Inadequate infrastructures, the absence of suitable transportation, a lack of teacher training that addresses students’ individual needs, and poor quality or nonexistent accessible learning resources prevent children with disabilities from attending or fully participating in school.<sup>6</sup> Ministries of education, funders, and nongovernmental organizations have started to focus attention on these barriers and are actively seeking opportunities to support solutions that better position education systems, educators, and fellow students to provide equitable learning opportunities for children with disabilities.

All Children Reading: A Grand Challenge for Development (ACR GCD)—a partnership between the United States Agency for International Development (USAID), World Vision, and the Australian Government—is an ongoing series of competitions that leverage science and technology to source, test, and disseminate scalable solutions to improve literacy skills of early grade learners in developing countries. Round 2 of ACR GCD, which started in 2014 and continues through 2018, supports technology-based innovations to improve early grade reading outcomes with three focus areas,<sup>7</sup> one of which is children with disabilities.<sup>8</sup> Three grants awarded under ACR GCD Round 2 sought to improve the reading outcomes of students who have low vision or are blind:

1. **Bookshare India, implemented in India**
2. **Lesotho Literacy for Young Visually Impaired Persons, implemented in Lesotho**
3. **Reading Beyond Sight, implemented in the Philippines**

To understand the ability of technology-based innovations to improve the literacy skills of early grade learners, ACR GCD Round 2 increased its focus on the assessment of early grade reading skills. School-to-School International (STS) collaborated with each grantee to develop a robust research study design and advise on the sampling and research groups; conduct Early Grade Reading Assessments (EGRA)<sup>9</sup> at each project’s baseline and endline to systematically assess project participants’ reading skills; and provide technical assistance on monitoring and evaluation, and fidelity of implementation activities. STS also conducted qualitative end-of-project interviews with project management, beneficiaries, and key stakeholders on each project to explore lessons learned from project implementation, understand how the project impacted beneficiaries, and assess the potential scalability of the projects.

This summary report presents an overview of the ACR GCD Round 2 projects that supported students who have low vision or are blind; key features of those projects, including a discussion of literacy gains; and lessons learned to inform future funding and research. The report also includes a case study of the best practices employed by the Reading Beyond Sight project, implemented by Resources for the Blind, Inc., which significantly improved students’ literacy skills.

## Overview of ACR GCD Round 2 Projects that Supported Students Who Have Low Vision or Are Blind


Table 1 presents a summary of the three ACR GCD Round 2 projects that provided technology-based solutions to help students who have low vision or are blind improve their reading skills.

TABLE 1


### Bookshare India: Improving Reading Skills Among Primary Students with Low Vision or Blindness

Country/Grantee	Language	Targeted Reading Skills	INTERVENTION Hardware	INTERVENTION Software & Literacy Content
India - Beneficent Technologies, Inc.	Marathi		DAISY players	Audio stories on DAISY player accompany print braille books

### Lesotho Literacy for Young Visually Impaired Persons

Country/Grantee	Language	Targeted Reading Skills	INTERVENTION Hardware	INTERVENTION Software & Literacy Content
Lesotho - Catholic Relief Services	Sesotho		Mountbatten Pro brailler Jot-a-Dot portable brailler	Teacher training manual on reading strategies for students who have low vision or are blind

### Reading Beyond Sight: Improving Reading Scores of Children with Visual Impairment in Early Primary Education

Country/Grantee	Language	Targeted Reading Skills	INTERVENTION Hardware	INTERVENTION Software & Literacy Content
Philippines - Resources for the Blind	Filipino English		Braille embossers Braille displays for computers Printers CCTV DAISY players	Zoomtext Duxbury Braille Translator Microsoft Office Access to large-print and braille-formatted digital books

Pre-reading  Foundational  Reading comprehension 



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## Bookshare India

Beneficent Technologies, Inc. (Benetech), a U.S.-based nonprofit that creates scalable technology solutions, implemented the Bookshare India project in Maharashtra, India, from August 2015 to June 2017. With support from University Research Co., LLC, Bookshare India aimed to improve early grade reading skills—specifically, pre-reading and foundational skills—among students in Grades 2 and 3 who have low vision or are blind. Bookshare India provided the following assistive technology:

**DAISY players**, Digital Accessible Information SYstem audio players<sup>10</sup> loaded with audio recordings as accompaniment for Marathi-language braille books



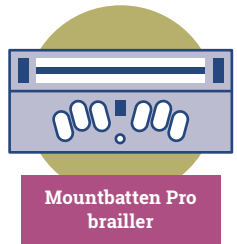
The Bookshare India project had three intervention components: provision of appropriate reading materials to students, weekly classroom visits by a local “story uncle” or “story auntie,” and consistent independent reading time for students each day at school. Each term, the project provided a new set of stories printed in braille<sup>11</sup> to students so that they could read along as they listened on their DAISY players. The story uncle or auntie, a Benetech staff member, visited schools on a weekly basis to conduct guided-reading sessions. Students also had the opportunity to practice reading for 15 minutes using their braille storybooks and listening to their DAISY players each day the story uncle or auntie did not visit. The project reached 131 students who have low vision or are blind in Grade 2 or 3 at four schools in Maharashtra, India. The grant award was \$408,995.



Lesotho

## Lesotho Literacy for Young Visually Impaired Persons

Catholic Relief Services (CRS), in collaboration with the Lesotho Ministry of Education and Training, implemented the Lesotho Literacy for Young Visually Impaired Persons project from February 2015 to February 2017. The project’s goal was to improve the early grade reading skills of primary school students in Grades 1 through 3 who have low vision or are blind. Participating schools were provided with two assistive technologies:



**Mountbatten Pro brailers**, a braille embosser to be used by teachers that features a braille keyboard, memory system to store braille-text files, speech feedback function so users may listen to typed or saved text, and reversible text-to-braille translator<sup>12</sup>

**Jot-a-Dot portable brailers**, a compact braille embosser to be used by students that utilizes a six-key braille entry system

The Lesotho Literacy for Young Visually Impaired Persons project provided teachers with training on how to use the technologies in the classroom. In addition, the project developed a teacher resource guide and curriculum materials, which included individualized lesson plans and braille reading materials. However, due to significant delays, the materials were not completed in time to be used during the project’s implementation. The project supported 30 students who have low vision or are blind in Grades 1 through 3 in an urban area of Lesotho. The grant award was \$221,530.



Photo: Resources for the Blind



## Reading Beyond Sight

Resources for the Blind (RBI), in collaboration with the Philippines Department of Education, implemented the Reading Beyond Sight project from October 2015 to February 2017. The project’s goal was to improve the literacy skills of students in Grades 1 through 3 who have low vision or are blind by providing supplemental reading materials, literacy lessons, assistive technologies, and training to students, their teachers, and their parents.

RBI provided participating schools with a comprehensive package of assistive technologies that included one of each of the following items:

**Desktop computer** preloaded with **Zoomtext**, a fully integrated magnification and reading program tailored for low-vision readers;<sup>13</sup> **Duxbury Braille Translator**, a software package that converts text into braille and formats it for printing with a braille embosser;<sup>14</sup> and **Microsoft Office** software suite



Desktop computer

**Braille embosser**, a device used to render text in braille cells on embossing paper



Printer

**Braille display terminal**, a device that provides access to information on a computer screen by electronically raising and lowering different combination of pins, thus enabling users to read the screen<sup>15</sup>

**Printer** to produce large-print materials



DAISY player

**Portable closed-circuit television (CCTV)** provides individuals with low vision with a variable and portable system that magnifies hard-copy text to a screen<sup>16</sup>

**DAISY player**, an audio device with accessible navigation features utilized by students to listen to stories and record lessons in their mainstream classrooms



Photo: Resources for the Blind

Additionally, RBI provided students participating in the Reading Beyond Sight project with the following:



Optical devices, including magnifiers

**Optical devices**, such as high-powered eyeglasses and magnifiers, or **non-optical devices**, such as bookstands, according to their needs

**Braille mats** and **reading guides**, supportive tools to help students track braille text or isolate large print words to facilitate reading

In addition to providing assistive technologies, RBI worked with the Philippine Department of Education's Special Education Division and teachers to transcribe the department's reading materials into formats accessible to students who have low vision or are blind. The project provided teachers training on how to use the equipment and technologies as well as information on teaching strategies and reading approaches for students who have low vision or are blind. RBI also offered sensitivity and skills training for parents and guardians of children who have low vision or are blind. The Reading Beyond Sight project supported 82 students who have low vision or are blind in Grades 1 through 3 at 15 schools on the Philippines' three main island groups: Luzon, Visayas, and Mindanao. The grant award was \$394,784.



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# Project Highlights

## Research Design and EGRA Development

Given the different contexts, interventions, and beneficiary populations of each project, research designs varied to best fit each grantee's unique needs. RBI's Reading Beyond Sight project was assessed through a quasi-experimental study design that included an intervention group and a comparison group; all students were assessed in the two languages used in early grades, Filipino and English. Benetech's and CRS's projects lacked a comparable population of students in the intervention area; therefore, their projects were assessed using a reflexive comparison design that measured the improvements from baseline to endline of a single group of students who received the intervention. For students participating in either the Benetech or CRS project, it was not possible to determine the extent to which observed improvements were the result of the intervention or of expected learning achievement from an additional year of schooling.<sup>17</sup>

All three grantees partnered with local experts, stakeholders, and STS to adapt an EGRA specifically for their student population and language context. In each instance, EGRA items were reviewed for appropriateness, including avoiding visual references in the reading and listening passages. Based on guidance from reading experts knowledgeable in braille fluency rates, students received three minutes to complete items on timed subtasks, rather than the one-minute period generally provided.<sup>18</sup> Across projects, STS and the project team trained EGRA assessors on the stimuli and best practices for recording responses electronically in Tangerine.<sup>19</sup>

## Literacy Gains

Table 2 provides a summary of the research design and EGRA results for the three projects that supported students who have low vision or are blind. Across all three projects, students showed improvement in their literacy skills following participation in the interventions.

The Bookshare India project, which targeted students' pre-reading and foundational skills, had promising results. **Students who participated in the Bookshare India project had significantly higher scores across EGRA subtasks at endline compared with baseline.** This trend was observed across gender and grade as well as among both students who have low vision and students who are blind.<sup>20</sup> The research design of the Bookshare India project did not allow for a comparison group, due to the limited number of schools in the intervention area that specifically serve students who have low vision or are blind. The observed improvements in reading skills are the result of both the intervention and an additional year of schooling.

**Overall, students who participated in the Lesotho Literacy for Young Visually Impaired Persons project showed improved reading skills—including in the targeted pre-reading and foundational skills—over the life of the project.** Students' mean EGRA scores were higher at endline than at baseline on all subtasks. Because the project's student population attended either the only national school specifically serving students who have low vision or are blind or the neighboring mainstream primary school, no comparable group existed in Lesotho. The lack of a comparison group means that it is not possible to determine if the observed results represent improvements from maturation and the intervention or from an additional year of schooling alone.

TABLE 2

## Summary of Research Design and EGRA Results by Project

Project		Bookshare India	Lesotho Literacy for Young Visually Impaired Persons	Reading Beyond Sight	
Research Design/Groups		Reflexive comparison: (1) intervention	Reflexive comparison: (1) intervention	English EGRA; Quasi-experimental: (1) intervention and (1) comparison	Filipino EGRA; Quasi-experimental: (1) intervention and (1) comparison
Sample Size <sup>21</sup>		49	21	143	
PRE-READING	Letter Sound Identification/ Letter Name Identification				
	Syllable Identification				
FOUNDATIONAL	Nonword Reading				
	Familiar Word Reading				
	Oral Reading Fluency				
	Listening Comprehension				
COMPREHENSION	Reading Comprehension				

Targeted EGRA Reading Skills and Results by Subtask

Subtask not on EGRA

Targeted skill



Gain of one intervention group was statistically significantly greater than comparison group gain



Intervention group had higher scores at endline than at baseline (no significance testing conducted)

**RBI's Reading Beyond Sight project, which included a comparison group, had a positive impact on the literacy skills development of students who participated in the intervention.**

Students were assessed in both Filipino and English, as schools in the Philippines begin using both Filipino and English in Grade 1 and because RBI was interested in understanding students' reading skills—specifically the targeted pre-reading and foundational skills—in both languages. Although students in both the intervention and comparison groups made gains from baseline to endline on all subtasks on the Filipino EGRA, the gains of students in the intervention group were statistically significantly greater on all Filipino EGRA subtasks than were the gains of students in the comparison group.<sup>22</sup> Similarly, the gain scores of students in the intervention group were statistically significantly greater than the gain scores of students in the comparison group on all subtasks on the English EGRA.<sup>23</sup>

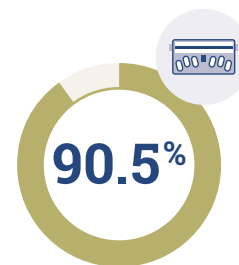
## Students' Use of Assistive Technologies

During end-of-project interviews conducted in tandem with each project's endline EGRA, **students who have low vision or are blind reported being comfortable using the provided assistive technologies and emphasized the overall usefulness of the devices in learning to read.** Students in the Lesotho Literacy for Young Visually Impaired Persons project used their braille embossers to write their name and take simple notes in class as well as to become more familiar typing in braille. Students were highly engaged in the project and showed favorable attitudes toward the new technologies. Nearly all students in the Lesotho Literacy for Young Visually Impaired Persons project—90.5 percent—agreed or strongly agreed that the Jot-a-Dot technology improved their reading; the same proportion said they wanted to continue using the technology to learn to read. In the Bookshare India project, students used DAISY players to listen to stories while reading along in their books and reported high levels of comfort with the technology<sup>24</sup> and high levels of engagement in the project.<sup>25</sup> Among the students with low vision who participated in RBI's project, many had access to a desktop computer loaded with Zoomtext software and a magnifying CCTV that enabled them to read large-print text. Students who are blind could use a braille display to access content on the desktop computer. All students served by RBI had access to shared DAISY players and could record and listen to stories. The majority of students—77.5 percent—in the Reading Beyond Sight intervention group said during the end-of-project interviews that they felt very comfortable using technologies to learn.

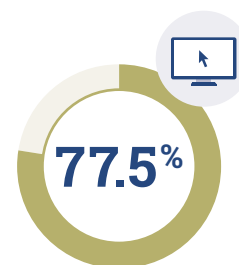
## Production of Appropriate Reading Materials Using Technology

**The technologies used by ACR GCD Round 2 grantees have great potential to facilitate increased and easier production of braille and large-print materials.** Both the Lesotho Literacy for Young Visually Impaired Persons project and the Reading Beyond Sight project provided brailers for teachers to produce reading materials. In the Philippines, prior to the Reading Beyond Sight project, appropriately formatted reading materials were very limited. Indeed, only three out of the 30 schools that were assessed as part of either the intervention or comparison group had access to appropriate reading materials from the Department of Education. Teachers who wanted to create resources on their own used a slate and stylus. As a result of the project, and using the technologies provided by RBI, teachers could download or create their own resources much more efficiently than before. **During the Reading Beyond Sight project, teachers created an average of 104.1 books or reference materials in accessible formats each week of the intervention.**

In Lesotho, there is also a dearth of appropriate and accessible reading materials. CRS instructed teachers in the Lesotho Literacy for Young Visually Impaired Persons project to use the electronic brailers provided by the project to create more materials for their students, especially those students who had been mainstreamed into primary school classes where braille reading materials were particularly scarce. Previously, teachers had to create teaching and learning materials for their students on Perkins manual brailers, which were slow and labor intensive. Although the teachers in the project received training on the technologies, uptake and use of the electronic brailers was limited due to low comfort levels when using information and communications technologies. Perhaps **as a result of low teacher uptake of the technologies provided by the Lesotho Literacy for Young Visually Impaired Persons project, braille materials production did not increase as much as was intended.** During end-of-project interviews, 81.0 percent of students reported that there were no Sesotho braille reading materials in the school, and 76.0 percent said there were none in their classrooms.



90% of students in the Lesotho Literacy project agreed that the Jot-a-Dot technology improved their reading



77.5% of students in the Reading Beyond Sight intervention group felt very comfortable using technologies to learn



Teachers created

**104.1**  
BOOKS

or reference materials each week during the Reading Beyond Sight intervention

## Resources for the Blind, Inc., and the Reading Beyond Sight Project

While all three projects reported positive reading gains, the Reading Beyond Sight project achieved remarkable success in helping students who have low vision or are blind learn to read. The RBI intervention was the most comprehensive of the three projects, with components that addressed teacher training and mentoring, assistive technology for students and teachers, parent engagement and advocacy workshops, and the provision of braille and large-print materials. Therefore, this project was selected for further exploration to better understand what factors contributed to students' statistically and functionally significant reading gains as well as what enabled the Reading Beyond Sight project to achieve this level of success.

### Reading Achievement

Students in the intervention group had statistically significantly greater gains than did their peers in the comparison group on all subtasks on both the Filipino and English EGRAs. Most notably, on the Filipino oral reading fluency subtask, students increased their average reading rate by 97.1 words in three minutes, in contrast with their peers in the comparison group, who averaged an increase of 50.7 words in three minutes (see Figure 1). Similarly, on the English version of the subtask, intervention group students read an average of 82.8 additional words within three minutes at endline over baseline; comparison group students read an average of 45.9 additional words (see Figure 2).

FIGURE 1  
Average Gain Scores from Baseline to Endline by Subtask and Group—Filipino EGRA<sup>26</sup>

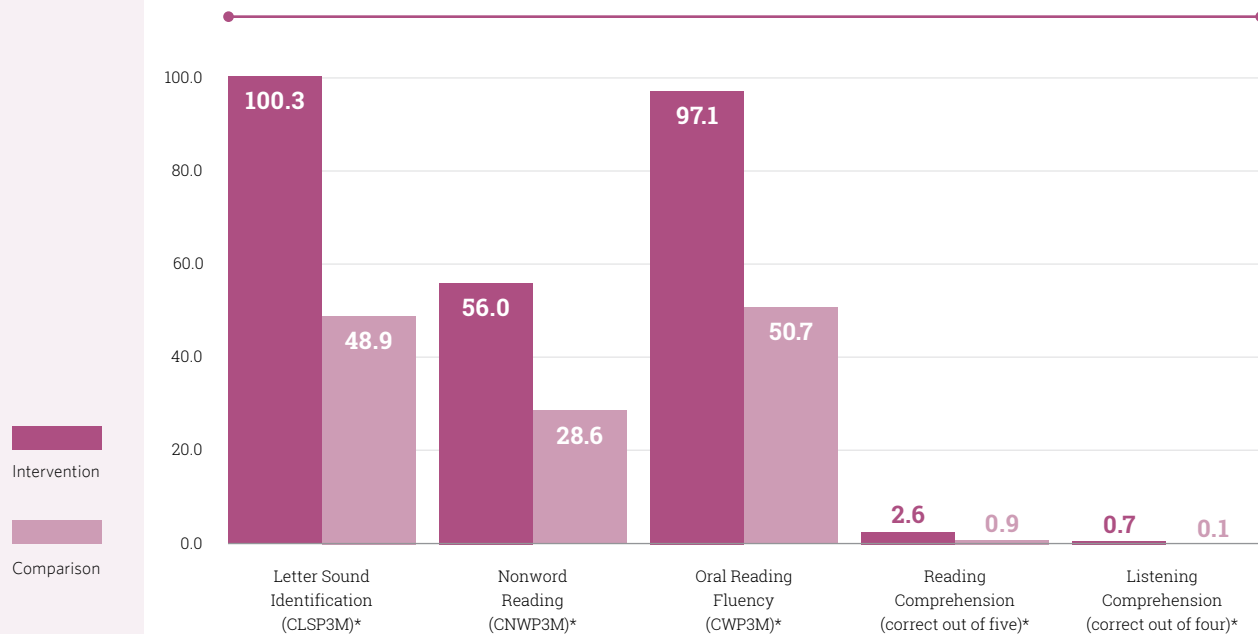
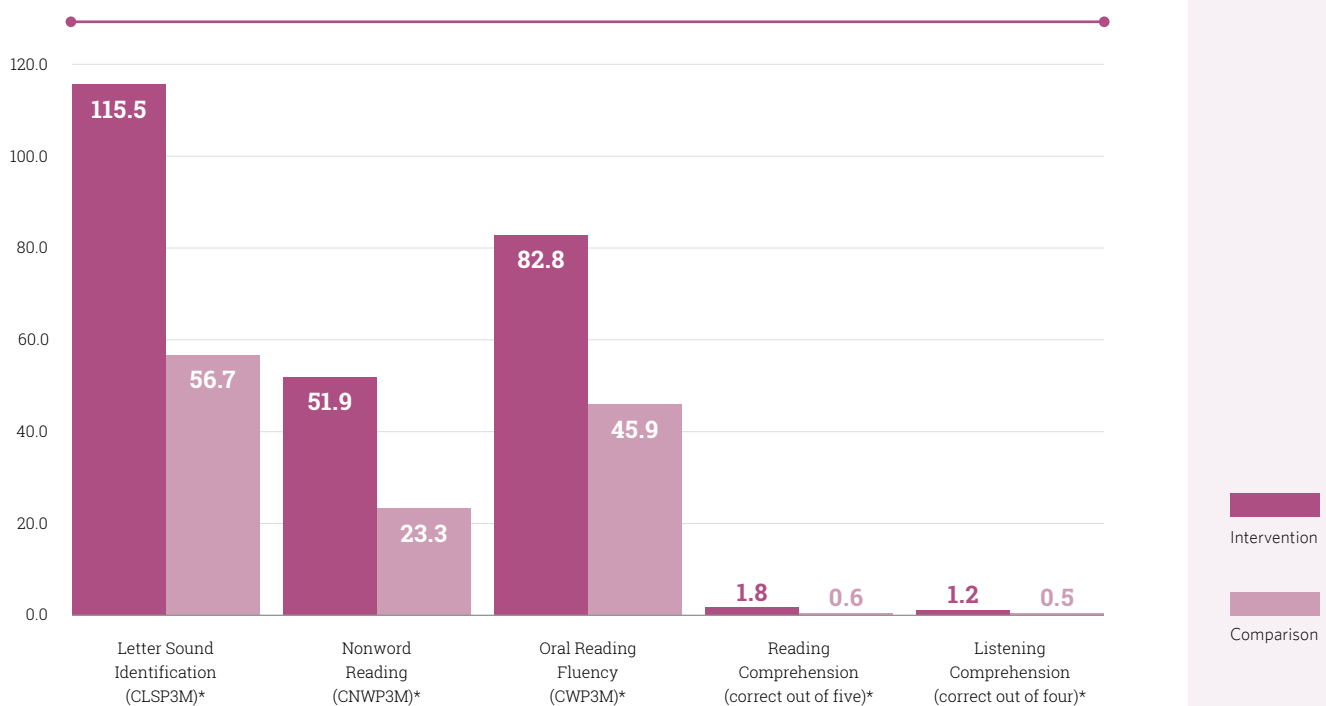




FIGURE 2

**Average Gain Scores from Baseline to Endline by Subtask and Group—English EGRA<sup>27</sup>**



## Organizational Capacity

RBI began working in the Philippines in 1988 to support people who have low vision or are blind. Even before the ACR GCD Round 2 grant, the entire organization was focused on addressing challenges and removing barriers for individuals. One of its primary goals was to ensure inclusive education for students. RBI has a main office in Manila and two regional offices in Cebu and Davao that employ more than 65 full-time staff members who specialize in all aspects of low vision and blindness. RBI staff members have expertise in developing braille materials, creating

and conducting trainings and workshops, organizing parents and other stakeholders, and facilitating job creation. RBI also has an established relationship with the Philippines' Department of Education Special Education Division and provides training to their special education teachers. RBI provides teacher training for inclusive education, braille production of textbooks and reading materials, and community mapping of students with low vision or who are blind. RBI also has experience conducting awareness campaigns to identify out-of-school students and increase their enrollment in primary school. The staff members leading the Reading Beyond Sight project were dedicated to the project, which benefited from little turnover and consistent relationship building between RBI and the schools, teachers, students, and parents. Prior to the ACR GCD grant, RBI had partnered with a number of organizations to enhance its work, including the International Council for the Education of the Visually Impaired, Christoffel-Blindenmission, USAID, and the Perkins School for the Blind.

### Research Design that Included a Comparison Group

The Reading Beyond Sight project collaborated with the Department of Education to identify more than 30 schools that met similar criteria to include in the study. As a result, the quasi-experimental research design included both an intervention and a comparison group, to which

schools were randomly assigned prior to the intervention's launch. Of the three ACR GCD grantees working with students who have low vision or are blind, only RBI engaged a large enough group of schools to have a comparison group, thus resulting in a more rigorous research design. While the number of students was still small, the results are statistically credible and provide evidence that allows attribution of the positive changes in students' reading outcomes to the project.

### Inclusive School Context with Built-In Support

In the Philippines, schools have special education centers to accommodate students identified as having special needs, and teachers are trained to support these individuals. In many other contexts, students with low vision or blindness are either placed in schools separate from their sighted peers or mainstreamed with little support. The special education centers have a standardized identification process to assess students' needs and place them in the appropriate stream of support. Students who have low vision or are blind spend their first year or two in the special education center, where they learn foundational skills before then moving into mainstreamed classrooms. Once in a standard class, special education teachers continue to provide support by creating braille or large-print materials to help the student learn along with his or her sighted peers.

All the schools in the project had a special education center, which employed a specially trained teacher assigned to work specifically with students who have low vision or are blind. Most of these teachers had received training from RBI at some point prior to the Reading Beyond Sight project, as RBI partners with the Department of Education to provide summer training institutes for educators working with students who have low vision or are blind.



Photo: Resources for the Blind



## Appropriate Match Between Technology and User

At the start of the intervention, the Reading Beyond Sight project team provided teachers with comprehensive training on how to use the new equipment and technologies. Teachers received supplemental training throughout the project on computer skills, teaching strategies, and reading approaches for students who have low vision or are blind. During their end-of-project interviews, many teachers reported that they already owned computers at home, and most felt comfortable with that technology prior to the project's launch.

Prior to the ACR GCD 2 grant, most special education centers did not have a printer appropriate for producing large-print materials. Similarly, before the project, teachers had to make braille materials with a slate and stylus, a time-consuming approach that impacted both the quality and quantity of the braille materials available to students. As a result of the intervention technologies, teachers were able to produce large-print and braille materials on a daily basis for their students, including reading books for students to take home to ensure independent reading practice. In addition, teachers learned new skills to teach reading to students who have low vision or are blind. Some teachers even rearranged their classroom to better accommodate students; such modifications included moving students to areas with more light, providing appropriate tables and chairs for use of stands and magnifiers, and providing easy access to the computers.

Finally, students could access reading and other learning materials through the desktop computer using the Zoomtext or braille display, depending on their needs. Students with low vision also had access to the CCTV to use when working with printed reading materials.

## Engagement of Parents and Guardians through Skills Trainings

RBI provided quarterly sensitivity and skills training plus monthly follow-ups for parents and guardians whose children were participating in the Reading Beyond Sight project. These workshops provided an opportunity for parents to gain a better understanding of their children's capabilities and learn how best to support their education. During end-of-project interviews, parents expressed their profound gratitude for these opportunities to learn and engage with other parents. Participating children were asked to read with their families each night, creating a culture of reading outside of school and encouraging parents to spend time learning with their children each day.

# Lessons Learned for Future Funding



## **Organizational capacity to support students with disabilities greatly impacts the quality of the intervention.**

While relevant for all projects, a lack of familiarity with the issues and possible solutions available to participants may present acute challenges during implementation to organizations that support students with disabilities. Organizations should engage technical advisors and experts knowledgeable of contextual challenges to design a comprehensive intervention that addresses the multitude of barriers facing students who have low vision or are blind.



## **Organizations should find a close match between the technologies provided through an intervention and the needs of students who have low vision or are blind and their teachers.**

Students who have low vision or are blind and their teachers have unique needs and skills that differ depending on the context. Luckily, numerous hardware and software options, with proven success in serving target student populations, already exist, although not all are readily available in developing countries. Needs and capacity assessments should be a critical part of project development, and implementers should select technologies that best fit their project's specific circumstances. Projects should also invest heavily in developing adults' information and communications technology skills to ensure appropriate uptake among participants.



## **Students appear to be very willing and able to use technologies—and enjoy using them.**

While technology uptake was not consistent with teachers, students in all three projects expressed a willingness to use new technologies to help them learn to read. Furthermore, students had fewer challenges than did teachers when using technologies. The provision of assistive technologies to students who have low vision or are blind has great potential to motivate and support them in their education.



### **Engaged parents and caretakers appear to be critical to success.**



There are significant social stigmas facing children who have low vision or are blind, and families are often unaware of how to mitigate these stigmas and support their children's learning. In many cases, children who have disabilities are sent to specialized schools where family engagement is limited or nonexistent. To achieve sustainable change and reduce the barriers facing these students, organizations should incorporate sensitivity training and skills training for parents so that positive learning experiences and support can be extended into the home.

### **Making material production possible at the school level can greatly impact student access to accessible materials.**



Many education systems do not have sufficient learning materials for students who have low vision or are blind. They also may underutilize teachers, who often know the needs of their students best. Through the direct provision of the technology necessary to create materials efficiently and regularly, teachers can more easily meet students' literacy needs. With the right resources, students have fewer barriers that restrict their ability to attend classes with sighted peers and read books independently.

### **Engagement with government stakeholders can enhance project rollout and potential for future scaling.**



Organizations that implement projects for students who have low vision or are blind may be helped if the local government already recognizes and supports quality, specialized learning experiences for students through official policy. However, in the absence of these conditions, organizations can play a key role in raising awareness of the challenges faced by students with disabilities and of the solutions that may help them. By engaging with government stakeholders during implementation, organizations can implement their projects more effectively and with greater opportunities for future scaling.

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## FOOTNOTES

- 1 United Nations Educational, Scientific, and Cultural Organization. (2015). *Education For All 2000–2015: Achievements and Challenges*. 100–101. Retrieved from <http://unesdoc.unesco.org/images/0023/002322/232205e.pdf>
- 2 World Health Organization, and World Bank. (2011). *World Report on Disability*. Retrieved from [http://www.who.int/disabilities/world\\_report/2011/en/](http://www.who.int/disabilities/world_report/2011/en/)
- 3 World Health Organization. (2017, October). *Vision Impairment and Blindness*. Retrieved from [www.who.int/mediacentre/factsheets/fs282/en](http://www.who.int/mediacentre/factsheets/fs282/en)
- 4 World Health Organization, and World Bank. (2011). *World Report on Disability*. Retrieved from [http://www.who.int/disabilities/world\\_report/2011/en/](http://www.who.int/disabilities/world_report/2011/en/)
- 5 United Nations. (2017). *Convention on the Rights of Persons with Disabilities*. Retrieved from <http://www.un.org/development/desa/disabilities>
- 6 All Children Reading. (2017). *ACR Children with Disabilities Info Sheet*. Retrieved from <https://allchildrenreading.org/resources/acr-children-with-disabilities-info-sheet-2/>
- 7 All Children Reading. (2017, June). *About us*. Retrieved from <http://allchildrenreading.org/about-us/>
- 8 Additional focus areas include mother tongue instruction and reading materials, and family and community engagement.
- 9 The EGRA is an oral assessment that measures students' most basic foundational literacy skills in the early grades—specifically, recognizing letters of the alphabet, reading simple words, understanding sentences and paragraphs, and listening with comprehension. The EGRA methodology was developed under EdData II and has been applied in more than 30 countries and 60 languages.
- 10 DAISY is a technical standard for digital talking books for people who have low vision or are blind or who have a print disability (e.g., dyslexia). DAISY is an audio substitute for print material that allows users to search, navigate, place bookmarks, and regulate the speaking speed of books found in the digital repository.
- 11 The project utilized Bharati braille, a unified braille system for writing the majority of the languages used in India.
- 12 All Children Reading: A Grand Challenge for Development. (2017). *Catholic Relief Services*. Retrieved from <http://allchildrenreading.org/innovators/catholic-relief-services/>
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- 14 Duxbury Systems, Inc. (2017). *Duxbury DBT: Braille Translation Software*. Retrieved from: <http://www.duxburysystems.com/>
- 15 American Foundation for the Blind. (2017). *Refreshable Braille Displays*. Retrieved from <http://www.afb.org/prodBrowseCatResults.aspx?CatID=43>
- 16 Magnifying Aids. (2017). *Products*. Retrieved from [https://www.magnifyingaids.com/Video\\_Magnifier\\_Desktop](https://www.magnifyingaids.com/Video_Magnifier_Desktop)
- 17 Research designs and EGRA results for each ACR GCD project are summarized in evaluation reports. See <https://allchildrenreading.org/research/project-evaluations/>
- 18 RTI International. (2016). *Early grade reading assessment (EGRA) toolkit, Second edition*. Washington, DC: United States Agency for International Development.
- 19 Tangerine® (<http://tangerinecentral.org>) is an electronic data collection software designed for use on mobile computers, including netbooks, tablet computers, and smartphones. Its primary use is to enable recording of children's responses in oral early grade reading and mathematics skills assessments, specifically EGRA and Early Grade Mathematics Assessment, and interview responses from children, teachers, and principals on home and school context information.
- 20 Due to the small sample size, statistical significance testing was not conducted on subgroups of Bookshare India students. As a result, it is not possible to conclusively determine if endline results were significantly greater than baseline results across EGRA subtasks.
- 21 Sample size for the final analysis, which does not include students who were assessed at baseline but not at endline.
- 22 The gain score for the intervention group was significantly greater than the gain score for the comparison group on the Filipino EGRA at  $p < 0.05$ .  $N$  sizes:  $N_{\text{Intervention}}=71$ ;  $N_{\text{Comparison}}=71$ .
- 23 The gain score for the intervention group was significantly greater than the gain score for the comparison group on the English EGRA at  $p < 0.05$ .  $N$  sizes:  $N_{\text{Intervention}}=71$ ;  $N_{\text{Comparison}}=71$ .
- 24 During the Bookshare India endline, students responded to four items related to their use of technology. A composite score was created from these items. The average composite score was 3.4 out of 4.0, where 4.0 is highly comfortable using technology.
- 25 During the Bookshare India endline, students responded to seven items related to their engagement in the project. A composite score was created from these items. The average composite score was 6.3 out of 7.0, where 7.0 is highly engaged in the project.
- 26 An asterisk (\*) indicates the gain score for the intervention group was significantly greater than the gain score for the comparison group at  $p < 0.05$ .  $N$  sizes:  $N_{\text{Intervention}}=71$ ;  $N_{\text{Comparison}}=71$ .
- 27 An asterisk (\*) indicates the gain score for the intervention group was significantly greater than the gain score for the comparison group at  $p < 0.05$ .  $N$  sizes:  $N_{\text{Intervention}}=71$ ;  $N_{\text{Comparison}}=71$ .



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