RESEARCH BRIEF

The Impact of Mobile Learning Labs on Accelerated Learning and Life Skills of Over-age Primary School Girls in Liberia: An Evaluative Study

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Executive Summary

This research brief shares key findings from an evaluative study seeking to understand the cognitive and non-cognitive impacts of mobile learning labs (MLLs) on participants in CODE's *Girls' Accelerated Learning Initiative* (GALI).

Implemented in partnership with the WE-CARE Foundation in Liberia, the program annually supported 375 over-age girls (ages 10 to 16) in Grades 1 - 4 at 25 schools in Bomi, Margibi, and Montserrado counties between February 2021 and June 2022. Girls participated in daily small-group, after-school tutoring and life skills development classes, with nearly half of participants (N.165) having access to mobile learning labs (MLLs).

Each MLL comprised six tablets, a rechargeable server called a RACHEL-Plus, and a solar charging system. The server held up to 500 GB of open source, high quality, off-line grade-appropriate academic materials, and age-appropriate life skills content. Students accessed this digital material through a combination of directed and self-directed learning.

This study was a collaborative effort, with contributions made by A. Alvin Winford and the Foundation for Research, Education and Empowerment (FREE) Liberia, Dr. Karen Sharkey from the University of British Columbia, as well as CODE and WE-CARE Foundation staff. The study was conducted between March 2021 and June 2022.

Employing a mixed methods design, the study sought to understand the impact of MLLs on academic performance and life skills development through the collection and analyses of quantitative and qualitative data. SPSS and one-way AVOVA were used to determine statistical significance of differences between the intervention group (GALI girls with MLLs) and the control group (GALI girls without MLLs).

The study was guided by 6 research questions, for which we have provided a brief synopsis of findings below. The questions are:

- How do gains in literacy assessment scores compare between students with MLLs and those without?
- Are rates of grade-level promotion (mid-year and end-of-academic year), retention, and drop out of students with MLLs comparable to those without?
- Are levels of self-confidence, self-control, and aspiration among students with MLLs comparable to those without?
- How does knowledge of sexual and reproductive health and rights (SRHR) compare between students with MLLs and those without?
- Are there any differences in attitudes and perceptions towards gender parity between students with access to MLLs and those without?
- What is the difference in the level of support from parents/caregivers whose girls' have access to MLLs and those without?

Results showed that GALI girls in upper primary (i.e., Grade 4) who had access to MLLs were more likely to be reading at grade-level by a relatively large margin, but the impact of MLLs on reading ability at lower primary (Grades 1 -3) was less conclusive. The MLLs showed the potential to positively influence rates of grade-level promotion (which is the goal of GALI), as well as deliver statistically significant differences between the MLL and no MLL access groups regarding knowledge of sexual health and the development of self-esteem.

Context

Liberia's education sector is faced with numerous challenges. They range from poor learning outcomes (most notably foundational literacy and numeracy) and vast numbers of out-of-school children to significant lack of qualified teachers and a dearth of learning materials. Poor parental and community engagement, and under-funding of the education sector are also often noted as severe limitations.

Paramount amongst the challenges is the high proportion of over-age student enrollment. Currently, at the primary level, 79% of enrolled students are over-age for their grade. In fact, Liberia has the highest over-age population of students in all of Africa.

Although the incidence of over-age enrollment is nearly the same for boys and girls, girls face a greater risk of dropping out due to a disproportionate burden of care for younger siblings, household chores, cultural norms that disadvantage girls, teen pregnancy, and early marriage, as well as safety concerns of parents. This is evidenced by the fact that an estimated 53% of girls enrolled in primary school either do not finish or do not transition to secondary school compared to 38% of boys (UNICEF) - only 14% of the poorest girls complete primary school (Liberia Ministry of Education). This ultimately contributes to a substantial difference in youth (15-24) literacy rates between girls and boys, 63% and 84% respectively (UNESCO).

Over the past 12 years, CODE and WE-CARE have implemented education programs in 133 schools in the four counties of Montserrado, Bomi, Margibi and Grand Bassa. In each school, investments have supported a cohort of trained teachers, created libraries of culturally relevant books and contributed to the creation of more student-centered and gender-responsive learning environments. Twenty-five out of these 133 schools have also participated in GALI.

Since GALI was first piloted in 2017, CODE and WE-CARE have supported 1200+ over-age girls to stay in school, learn to read, advance rapidly to a more age-appropriate grade, and gain valuable life skills.

Mobile Learning Labs (MLLs) were first introduced into the program in 2019 in one school with the support of Kolibri and the 60 million girls Foundation in Montreal, Canada. The pilot showed anecdotal success, which led to the expansion of MLLs to 11 schools and an interest in conducting more focused study of their impacts. In the most recent program on which this study is based, girls had access to MLLs on average one hour and 15 minutes each week.

Methodology

Design

The research study employed both quantitative and qualitative data collection. Structured individual interviews formed the basis for the quantitative aspect of the study. In addition, WE-CARE provided data concerning grade-level promotion, school retention and reading assessments of girls with and without MLLs. The qualitative information was collected through focus group discussions (FGD) with students and teachers.

It was originally envisioned that over the two academic years of the most recent GALI program (2020-2021 and 2021-2022), qualitative data would be collected at three different times: a baseline, a midline and an endline. However, due to pandemic-related delays in school reopening and a significantly shortened academic year in 2020-2021, the decision was made to forego the midline. Consequently, only a baseline and endline were conducted for the survey component of the study.

Individual interviews and FGD data were collected by five trained female data collectors along with two males who supported the data collection from administrators and teachers only. This data was collected under the supervision of Dr. Charles Gbollie, Founder and Executive Director of FREE Liberia.

Literacy assessment data collection was conducted by trained WE-CARE staff as part of their routine program implementation and data was analysed by Dr. Shirley Mills from Carleton University (year 1) and by Dr. Karen Sharkey from the University of British Columbia (year 2). A baseline and an endline were conducted in year 1 and again in year 2 for a total of four assessments. The literacy assessments conducted in year 1 were , however, disqualified due to the persistent school closures and severely shortened academic year.

Sampling

Four schools were selected in each of the three counties with careful consideration for representation of schools in urban, peri-urban and rural settings. In each county, the sample included two schools with MLLs and two without MLLs. Each school had eight over-age girls participating in the interviews and focus groups for a representative sample of 96 students. Simple Random Sampling technique was used to select students to participate in the research.

Of the 96 participants, 53% had participated for the full two-year GALI program, the balance only for one year. Of the 96 students interviewed, 77% were between the ages of 11 and 14 and 52% were living with guardians other than their parents. Drawn from this interview sample were 48 students who also participated in Focus Group Discussions – 24 with and 24 without access to MLLs.

The study also collected information from 21 teachers and 12 school principals participating in the program. Of the teachers, 20% had only high school diplomas, 20% had a Bachelors Degrees, and the balance had a “C” Certificate – the basic teaching qualification for primary grades in Liberia.

For the literacy assessments in year 2, all girls were tested during the baseline reading assessment conducted in December 2021 and those same girls were retested during the endline. The total number of girls included in the reading assessment after data clean-up were 223 spanning Grades 1 – 4, of which 107 had access to MLLs.

The school retention and grade-level promotion data (mid-year and end of year) was provided in the form of academic records for all GALI participants.

Tools

The interview tool was a survey comprised of three sections for all students: 10 fill-in-the-blank questions covering student information, 10 multiple-choice questions concerning knowledge gained on key topics such as avoiding pregnancy and HIV/AIDS, and 12 yes/no questions concerning more general impacts of participating in GALI. In addition, students with access to MLLs answered a fourth set of 12 multiple-choice questions concerning their experiences and perceived impacts of using MLLs during GALI. Interviews were conducted one-on-one with the data collectors asking the questions, ensuring clarity and recording the students' responses.

The Focus Group Discussions tool was comprised of two sections, one for basic information (six questions) and one for guiding discussion (18 questions).

Teachers and school administrators were asked to fill in a survey in which they answered basic questions about themselves, had to rate various elements of GALI and then asked open-ended questions regarding challenges, lessons learned, and recommendations for program improvement.

A limitation of this study was that different research teams conducted the baseline and endline of the study. The research team that developed the original tools and conducted the baseline resigned their consultancy in July 2020 shortly after completion of the baseline data collection. This was unfortunate but not surprising considering the challenges presented by the pandemic. A new research team was contract in early 2022 to complete the endline. The second research team reviewed closely the original tools and the data collected and made recommendations to revise the tools to adequately address the research questions as well as maximize complementarity and comparability.

The literacy assessment tool was used consistently in administering baseline and endline assessments for both the first and second year of the program. It is specific to CODE's Liberia program and is an adaptation of the Early Grade Reading Assessment (EGRA), which contains five sub-tests for Grade 1, six for Grades 2 and 3, and assessment of reading levels for Grade 4.

Analysis

FREE Liberia researchers conducted the analysis of the survey and Focial Group Discussion data collected. They utilized Statistical Package for Social Sciences (SPSS) version 20 for data entry and analyses for the quantitative data. Predicated upon the study questions, necessary statistical techniques, especially One-way repeated-measures ANOVA was used to compare several means of particular group components at the same time. It provided insight into whether the differences in mean scores for students at schools with MLLs were statistically significant from those at schools without MLLs. Reading assessment data analysis for year 2 reading assessment (baseline and endline) contained in this study was completed by Dr. Karen Sharkey from the University of British Columbia.

Key Findings

Question 1

How do gains in literacy assessment scores compare between students with MLLs and those without?

Data from the first year of the program (2020-2021) was excluded from this analysis as it did not provide reliable data. The window of time between the baseline and endline was too short - a result of the relative "chaos" of schools reopening after a 10-month closure. The findings below are based on the second year of the program (2021 – 2022), which was closer in length to a normal school year (23 weeks vs. 29 weeks). Overall, the reading assessment results were mixed.

At the Grade 1 level the most notable difference was in reading comprehension with 93% of girls with MLLs showing an improvement as compared to 79% without. In sound pairs identified and sight word reading, a greater number of Grade 1 girls without MLLs improved compared to those with (6% and 9% better, respectively). The other subtests were generally on par (<5% difference).

In Grade 2, a larger proportion of girls with MLLs showed improvement in sentence writing (69% vs. 51%) and identifying onset/rime words correctly (100% vs. 92%). However, a larger proportion of girls without MLLs improved on phonemic awareness, sound pairings and reading comprehension (12%, 21% and 20% more, respectively). The other measures of literacy were generally on par.

In Grade 3, students without MLLs outperformed their counterparts on all measures of literacy tested. On six of eight measures the difference was 10% or higher. At the Grade 4 level, 50% of girls with MLLs were reading at their appropriate grade-level in comparison to 32% in schools without MLLs.

Based on these findings, we conclude that access to MLLs did not have a consistent, significant, or overall positive effect on reading assessment scores of girls in the GALI program.

Question 2

Are rates of grade-level promotion (mid-year and end-of-academic year), retention, and drop out of students with MLLs comparable to those without?

In the first year of the program, 59% of participating girls (both those with and without MLLs) were promoted twice in one year. While this result did not meet the target, it's understandable given the severely curtailed academic year. In the second year, 77% were promoted twice in one year, exceeding the target of 75%.

Disaggregated data analysis showed 80% of girls with MLLs were double-promoted in comparison to 73% without. This points to an advantage conferred by the usage of MLLs. There were no notable differences identified in retention and drop-out rates between the two groups.

Question 3

Are levels of self-confidence, self-control, and aspiration among students with MLLs comparable to those without?

The ANOVA results showed a statistically significant difference in participants' responses to requests for sexual favors and development of self-esteem. **More specifically, girls with MLLs were more likely to say "No" to requests for sexual favors and reported feeling more confident than girls without MLLs.**

Question 4

How does knowledge of sexual and reproductive health and rights (SRHR) compare between students with MLLs and those without?

The ANOVA results showed statistically significant differences between the two groups regarding knowledge of sexual and reproductive health and rights. Students attending schools with access to MLLs showed more favorable responses with respect to teenage pregnancy and prevention, protection from violence, and general knowledge of reproductive health than students without access to MLLs.

Question 5

Are there any differences in attitudes and perceptions towards gender parity/equality between students with access to MLLs and those without?

Most questions asked in the survey related to gender parity/equality did not yield a statistically significant difference although there was a small mean difference between the two groups. **There was, however, a statistically significant difference between the groups in answer to the question, "Who do you think should be able to go to school?"** More girls in the MLL access group noted that girls should be allowed to go to school, which suggests that access to MLLs positively influenced the knowledge and/or attitudes of respondents on this question.

Question 6

What is the difference in the level of support from parents/caregivers whose girls' have access to MLLs and those without?

Survey results showed that 98% of the GALI participants noted receiving a lot of support from their parents/caregivers and 100% said they received a lot of support from their teachers. **No statistically significant differences were found between respondents with and without access to MLLs.**

Limitations

Key findings shared in this research brief should be considered within the context of the following limitations of the research study:

- This study did not explore other extraneous variables such as teachers' qualifications, their knowledge of ICT, and school facilities – all which could have significant bearing on student performance.
- Students who graduated from GALI were not included in the study.
- Interview tools were modified between baseline and endline due to some faults identified in the original tool due to a change in research consultants.
- School closures and pandemic-related changes to the academic calendar (including compressed years) presented challenges, resulting in very short duration between reading assessment baseline and endline data collection.
- The one-on-one administration of the survey was time consuming and limited the sample size, though it likely increased the quality of the data collected.
- Only 53% of girls sampled had been in the program for two years and could be guaranteed to have completed the full life-skills curriculum.
- Data collection issues – data entry errors required quite a number of exclusions from reading assessment data set.

Discussion & Conclusions

Before the pandemic and even more in its aftermath, the education community has acknowledged the value as well as the challenges of online or digital learning.

It's widely recognized that ICT presents a tremendous potential to increase the availability of learning resources to young learners and their teachers. In too many places across sub-Saharan Africa, schools do not even have libraries, much less digital resources. Mobile learning labs can not only provide classrooms with thousands of books to read but also critically-needed learning materials in math, science, geography, etc. – for both students and teachers. These additional resources can make a significant difference in a child's education. Our study aimed to gain insights into some of those differences for over-age girls participating in GALI.

The primary academic indicator used in this study was reading scores although one can infer from the test scores, which enabled midyear promotion, that there were also gains across other subject areas. As indicated above, based on reading improvement only, the results are mixed. There was a negative correlation between MLL access and reading improvement identified for Grade 2 and 3 participants, and conversely a positive correlation in Grade 4 between access and reading at grade-level. At the Grade 1 level the differences were minimal.

These differences are perhaps reflective of the content included on the MLLs or a higher level of digital literacy of girls in high grades that allows them to better utilize the content. It does, however, suggest that at lower-grades, MLLs may not add as much value in addition to traditional print resources – in fact spending time with MLLs during the after-school program may distract from valuable teacher-led learning time. It is also worth a further review of all the content on the MLLs to ensure there is sufficient high-quality content for all grades in all subject areas, and that teachers with responsibility for using MLLs are adequately equipped to take full advantage of the grade-appropriate content.

In peri-urban and rural schools in Liberia, where availability of smart phones is still the exception rather than the rule; where there is generally low digital literacy; and where fundamental issues of access to electricity and security of equipment are of constant concern, it's necessary to weigh the benefits of MLs against the costs – and indeed, to understand the real accrued benefits to students, in this case, over-age adolescent girls.

Many of the GALI schools with access to MLLs did in fact have challenges with low digital literacy of teachers. They required regular external support for technology troubleshooting, and to learn how to effectively use the technology to deliver the academic and life-skills content. It would not be unreasonable to say that valuable instructional time was used on setting up and handling the MLLs – time that teachers without access to MLLs used to cover academic content. This might help explain why some students without MLL access performed better in reading scores than students with access, although the results varied from grade to grade.

As previously mentioned, reading (language arts) is only one of several subjects that are tested when promoting girls from one grade to the next, and the study shows that there was a modestly better double-promotion rate for girls with access to MLLs (by a difference of 7%). Interviews conducted with the girls revealed that they often talked about the math games and the improvements in their math scores. Similarly, there is high potential for improvements in a subject like science where students can observe experiments or real-life videos of things they can only theoretically discuss in class when they do not have access to MLLs. Lastly, but also significantly, the girls are gaining valuable digital skills that will give them an advantage in their future endeavors in an increasingly digital world.

It was frequently noted that the parents of the girls with access to the MLLs were enthusiastic about this opportunity afforded to their girls and anecdotally some made sure their girls did not miss school on the day they would have access. The true academic value of the MLLs lies in a wide range of subjects, including digital literacy, and we would caution not to draw quick conclusions based on reading scores alone.

MLL programs run by other charitable organizations have focused on the participants using the MLLs exclusively for self-directed learning. While GALI used MLLs for combination of teacher-guided and self-directed learning, it was more often teacher-guided. In future it may be interesting for students to have more time without the intervention of teachers to allow for greater self-exploration guided by personal interests. The MLL Coordinator for GALI indicated that in her experience students were often quicker than their teachers to learn how to use the MLLs. Perhaps teachers impede efficient use of the MLLs and left to explore on their own, the girls would make more valuable use of the time. The WE-CARE Foundation is suggesting allowing students to access the MLLs during free periods or recess – to facilitate greater self-directed learning in future.

The statistically significant differences in development of self-esteem, knowledge of sexual and reproductive health, and attitude toward gender parity/equality also shouldn't be under-estimated. For GALI participants, having access to MLLs can be both a motivation and an opportunity to access otherwise unavailable resources and/or culturally sensitive content. Access to this information can equip them to make healthier decisions for themselves and may serve as an encouragement to stay in school and a motivation to attend more regularly.

This study, despite its limitations, moves CODE toward a clearer understanding of the potential of MLLs, and how best to leverage them alongside its core programming, which focuses on improving learning outcomes through investments in teacher development and access to high-quality print learning materials. The results of this study will be carefully considered in future program design and the impacts of MLLs will continue to be an area of exploration through CODE's evaluative learning activities.

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