Research Brief

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Two-year RCT of EdTech in Malawi

Impacts of a 2-year education technology program on early primary learning in Malawi amid disruptions due to COVID-19

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Summary

Malawi's primary education system has been challenged to provide quality learning in the face of expanding enrollment. To address poor learning outcomes, the Ministry of Education piloted use of onebillion's onecourse software in about 100 schools. Initial studies of onecourse conducted over 8 weeks to 8 months produced significant effect sizes in math and literacy, although absolute gains were modest. To measure longer–term impacts, Imagine Worldwide conducted a 2–year efficacy randomized controlled trial in two Malawi schools. Despite COVID–related school closures, onecourse produced statistically significant impacts in literacy and math. Further, the 13 months of (interrupted) intervention produced larger effect sizes and higher rates of attaining emergent or fluent reading and math benchmarks than the prior 8–month study. Findings suggest that implementing onecourse in both Standards 2 and 3 may help Malawi attain its early grade learning goals. Further, results may have implications for periods of disruption due to other causes.

Background

Malawi's primary education system has made progress in increasing access to school over the last decade but is challenged to provide quality learning in the face of expanding enrollment (World Bank 2021). Pupil–Qualified Teacher Ratios exceed 80:1 in Standards 1–3 (Ibid.). By Standard 4, 19% of students still score zero on Standard 1 math items and only 22% are able to comprehend a short reading passage in the primary language of instruction (Ibid.). Ultimately, only 33% of children complete primary education (National Statistical Office 2021). To address poor learning outcomes, the Ministry of Education piloted use of onebillion's onecourse software in about 100 schools and is considering expanding the program nationwide.

Prior Research

Initial randomized controlled trials (RCTs) on onecourse in Malawi demonstrated significant effect sizes in math (.63) and literacy (.42) over 8 weeks and 14 weeks, respectively (Pitchford 2015; Pitchford, Hubber, and Chigeda 2017). A longer 8–month RCT found significant effect sizes of .34 in literacy and .15–.29 in early math skills (Levesque, Bardack, and Chigeda 2020). While these trials produced significant average effects, absolute gains were modest. Only 9% of the literacy treatment group and 19% of the math treatment group attained emergent or fluent status after 8 months. These findings suggest investigating the impacts of longer–term implementations of onecourse.

Study Purpose

Imagine launched a 2–year efficacy RCT in October 2019 in two Malawi government primary schools, intending to estimate the learning impacts of using onecourse for 16 months. However, due to the COVID–19 pandemic, Malawi schools closed multiple times during the study period (see Table 1 for timeline), resulting in 13 months of interrupted intervention. While COVID–related school closures during the study presented a unique situation, school disruptions are not uncommon in Malawi. In recent years, schooling has been disrupted by political unrest, a cyclone, and floods, and climate–related disruptions are expected to continue (World Bank 2021). Thus, this study presents impacts obtained during extremely difficult circumstances. The findings may be relevant for other periods of interrupted schooling in Malawi and in other countries experiencing similar challenges.

Table 1. Timeline of Malawi government school closures during study period

October 2019	March 2020	October 2020	January 2021	April 2021	November 2021
Study launches	Schools close due to COVID–19 pandemic	Schools reopen	Schools close due to a surge in COVID–19 cases and related teacher strike	Schools reopen for the remainder of the school year, which is extended to December 2021	Study concludes (total of 13 months of active intervention)

Research Questions

Primary research questions (with pandemic–related adjustment underlined) include:

Q1. What are the impacts over standard instruction on literacy and numeracy outcomes of using onebillion's onecourse software in Chichewa (either literacy or math) for 40 minutes per day for 2 interrupted school years (totaling 13 months of intervention)?

Q2. What impact does attendance in the intervention have on learning outcomes?

Q3. How far do treatment group children progress toward Malawi government benchmarks for reading and math in the lower primary grades?

Q4. Do treatment impacts vary by gender?

Answers to these questions (A1-A4) are on pages 6-7

Setting and Sample

Imagine purposively selected two primary schools for the study to represent urban and peri–urban (more rural) environments. Families in both communities were very low income and faced food insecurity as well as other poverty–related challenges. Neither school had electricity and class sizes were very large (up to 100 children). The onecourse program, "Unlocking Talent through Technology," typically focused on Standard 2 children. Ultimately, 578 Standard 2 learners across the two schools were enrolled in the study. The study sample represented primarily first–time Standard 2 learners of normative age who did not have a severe disability preventing use of the tablets. Table 2 describes sample demographics and eligibility criteria.

Table 2. Study sample demographics and eligibility criteria

	Urban school	Peri-urban school	Total
Total (n)	299	279	578
%	100%	100%	100%
Gender			
Female (n)	162	153	315
%	54%	55%	55%
Male (n)	137	126	263
%	46%	45%	45%
Age category			
Older (8–10) (n)	136	123	259
%	45%	44%	45%
Younger (6–7) (n)	163	156	319
%	55%	56%	55%

The children above met the following eligibility criteria at baseline:

1. Were confirmed to be enrolled in Standard 2.

2. Were 6-10 years old.

3. Had not previously used the tablet program (some repeaters used the program the previous year).

4. Did not have a serious disability that would prevent use of the tablets (e.g., vision impairment).

Intervention

The intervention provided supplemental learning in either reading or math. Treatment groups stepped out of different classes on different days of the week to use the reading or math software for 40 minutes per day in a dedicated learning center. The study used an updated version of onecourse in the Chichewa language, containing additional content compared with software versions used in earlier studies. The curriculum followed accepted pedagogy and was loosely aligned to the Malawi national education standards. Children progressed through the tablet curriculum at their own pace.

Intervention:
Child-centered, technology-enabled learning

Research-based pedagogy and curriculum

Reading and maths instruction in localized language

Solar-powered

Offline apps on tablet

Adults play facilitative roles

Environment is safe and conducive to learning

Research Design

The efficacy RCT used a non–clustered, blocked individual random assignment design. Standard 2 children at the two schools were assessed at baseline prior to randomization. Independently within each school, children were randomly assigned to two treatment groups (literacy or math) and one control group within four gender (male and female) and age category (6–7 years and 8–10 years) strata. Primary outcomes for the study were based on the Malawi adaptations of the Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA) in the Chichewa language and included (1) average EGRA percent correct (for the literacy intervention) and (2) average EGMA percent correct (for the math intervention). Tablet usage data along with hand–written attendance records were used in analysis of the impact of attending the intervention on learning outcomes.

Analytic Methods

We conducted the study in two main parts: (1) analysis of the impact of the intervention on learning outcomes for the overall sample and (2) exploratory analysis of whether treatment effects varied by gender. We produced two sets of impact estimates: Intent–to–Treat (ITT) estimates representing the impact of being assigned to the intervention, relative to being assigned to the control group; and Treatment–on–the–Treated (TOT) estimates representing the impact of attending the intervention at least 50% of the days the learning center was open, relative to attending the intervention fewer or no days. Attending at least 50% of the offered days was considered minimum compliance with the treatment. Because the two study schools were purposively selected, we conducted the impact analysis as a multi–site randomized trial, averaging separately derived site–level impacts and assuming fixed site effects. To obtain more precise site–level impact estimates, we adjusted for baseline student characteristics in an ordinary least squares regression model and used gain scores instead of endline outcomes as the dependent variables to avoid attenuation bias due to measurement error in the baseline measures. A full technical report will be available on our website at imagineworldwide.org.

Findings

At endline in November 2021, 462 out of 578 children persisted in the study. Overall attrition was 20%: 18% for each treatment group and 24% for the control group. Standardized mean differences met group design standards for baseline equivalence of the final analytic sample (with or without statistical adjustment), supporting the causal validity of our impact findings. Treatment groups attained a 64% average attendance rate in the intervention and accumulated an average of 101 hours of time on task. While these participation levels were lower than anticipated due to COVID–related disruptions (we had targeted 70% attendance and 120 hours of time on task), the resulting impacts were strong.

A1. Impact over standard instruction:

The intervention produced statistically significant impacts in both literacy and math: Intent–to–Treat (ITT) effect sizes were 0.37 and 0.54, respectively.
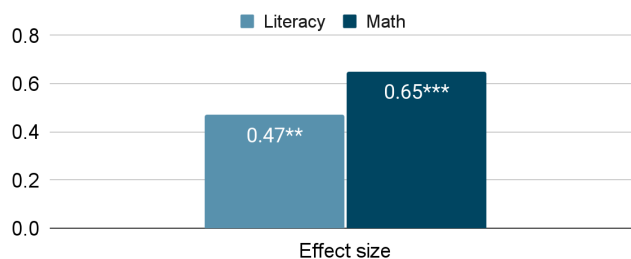

ITT effect sizes
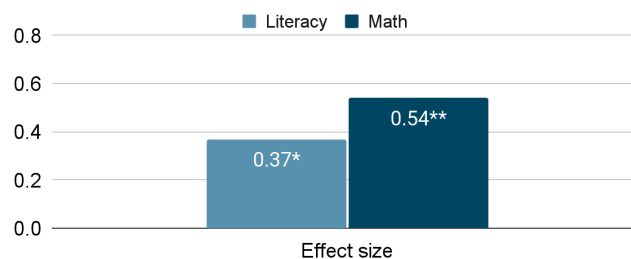
*Statistically significant at the p<.05 level.
**Statistically significant at the p<.01 level.

A2. Impact of attendance:

Attending at least 50% of the days that the tablet program was offered was associated with even greater impacts: Treatment–on–the–Treated (TOT) effect sizes were 0.47 and 0.65 for literacy and math, respectively.

TOT effect sizes

**Statistically significant at the p<.01 level.
***Statistically significant at the p<.001 level.

A3. Progress on Malawi benchmarks:

Compared with the control group, 50% more of the literacy treatment group advanced on reading benchmarks and 40% more of the math treatment group advanced on math benchmarks. At the end of the 2–year study, 29% of the literacy treatment group had attained emergent or fluent reader status and 72% of the math treatment group had attained emergent or fluent math status. This compares with 9% and 19%, respectively, after 8 months of intervention.

Benchmark status at endline
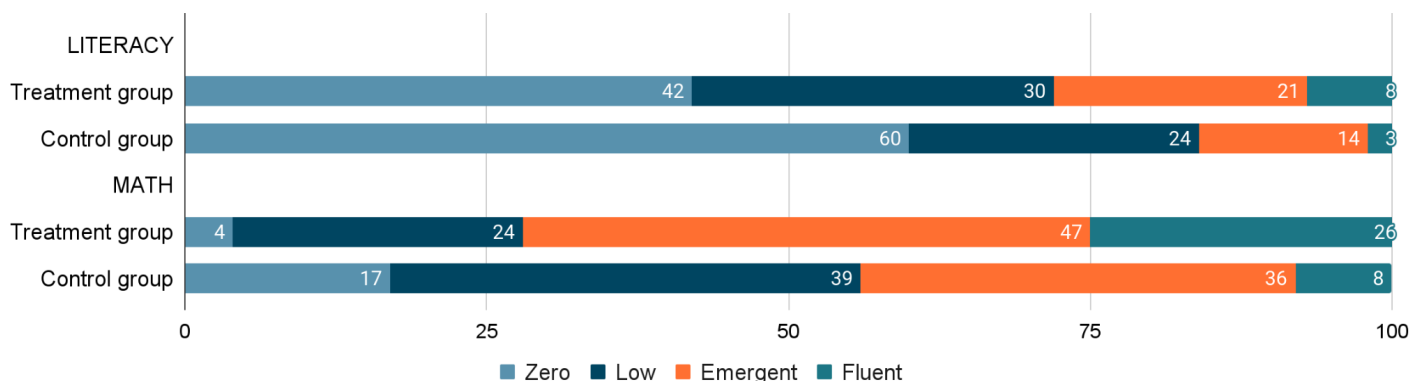
Literacy benchmarks are based on the oral reading fluency EGRA subtest.
Math benchmarks are based on the pattern completion EGMA subtest.
Some categories may sum to 101% due to rounding error.

A4. Gender impacts:

Exploratory analysis of the literacy and math ITT effect sizes for girls and boys found that differences were not statistically significant, indicating that both groups benefited similarly from the intervention.

Gender treatment effects
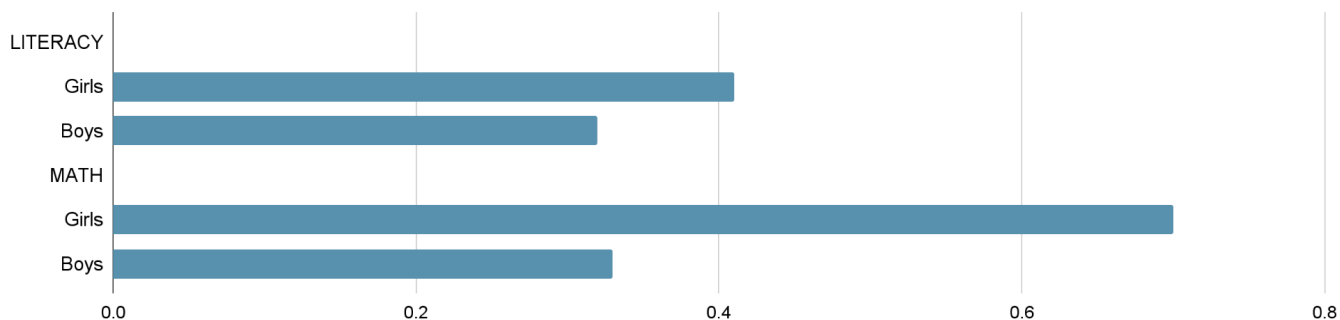
Differences between boys and girls were not statistically significant, possibly due to the study sample size being large enough to detect main effects only. Thus, analysis of gender impacts was exploratory.

Conclusion

Despite COVID–related school closures, onecourse produced statistically significant impacts in both literacy and math. Further, the 13 months of (interrupted) intervention produced larger effect sizes and higher rates of attaining emergent or fluent reading and math benchmarks than the prior 8–month study. Findings suggest that implementing onecourse in both Standards 2 and 3 may help Malawi attain its goals for early grade learning. Further, results may have implications for periods of disruption due to other causes. Positive results from all four RCTs conducted to date on onecourse in Malawi offer a strong basis for considering program expansion. If undertaken, we recommend a staged approach that monitors effectiveness at a larger scale and further investigates 2–year program impacts under less unusual circumstances.

ABOUT

Imagine Worldwide empowers children around the globe to build the literacy and numeracy skills needed to achieve their full potential. We believe child–directed, tech–enabled learning can deliver high–quality education and we are building an evidence base to show what works, for whom, and under what conditions.

University of Malawi's mission is to advance knowledge and to promote wisdom and understanding by engaging in teaching, research, consultancy, public and community engagement and by making provision for the dissemination, promotion and preservation of learning responsive to the needs of Malawi and global trends

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