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Digital vs Print: Obtaining the best literacy outcomes in complex low-income environments

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LIBRARY FOR ALL

Digital vs Print: Obtaining the best literacy outcomes in complex low-income environments

The appetite for digital education solutions (or 'EdTech') has soared under the impact of COVID-19, with students around the world unable to attend on-site schooling. Like many facets of the global literacy challenge, however, limited access to schooling was already a major concern for many communities. Exploring digital solutions for these complex environments is a key driver for Library For All (LFA), an innovative specialist EdTech provider and 'digital first' publisher. Field experience, across delivery of multiple international programs, confirms that a digital rollout of books and educational materials makes good sense in communities where access to print materials is unaffordable or otherwise unavailable. This paper surveys current thinking across academic and NGO research activities in support of LFA's approach.

In affluent countries, EdTech is already ubiquitous, with the potential for gamification and interactivity practically limitless. Variable literacy outcomes are reported, however, despite high investment in education technology. The evidence increasingly reminds content creators to favour evidence-based, quality digital education tools – not just 'tech for tech's sake'.[1] In low-income countries, it can seem counterintuitive to suggest that digital libraries are a feasible solution. There are additional considerations at play here, such as preservation and delivery of print-based materials, as well as shifting support on the ground from complex and underfunded education systems.

So, if literacy attainment is the primary goal of Library For All's activities, what are the best solutions for balancing the potential of digital literacy tools with environmental limitations, and ongoing research debate around whether digital technology improves literacy outcomes?

Why digital? Preservation, access and storage

The first part of this discussion rests on logistics. It seems contentious to suggest that digital libraries are a feasible solution for remote and low-income communities for whom basic safety and sanitation are hard to attain. But there are some 3 billion unique smartphone subscriptions globally, with a penetration rate of 55% of the global population, anticipated to be 66% by 2022.[2] This high penetration figure is relatively consistent across several studies, including specific examinations of low-income countries.[3] While electricity supply, data costs, and security may be ongoing concerns in some regions, in other regions with high poverty indicators, access to electricity and phone data is still possible. As such, we no longer associate mobile device ownership with affluence. This was the original driver for the development of a 'library for all': people do not have books, but they do have phones. Why not put a library in the palm of their hands?

[1] "Screen Time And Young Children," September 2020, https://www.global-edtech.com/screen-time-and-young-children/.
[2] "Forrester Data: Mobile, Smartphone, And Tablet Forecast, 2017 To 2022 (Global)," 2017, https://www.forrester.com/report/Forrester+Data+Mobile+Smartphone+And+Tablet+Forecast+2017+To+2022+Global/-/E-RES138971.
[3] World Bank Group, World Development Report 2016: Digital Dividends (Washington, DC: World Bank, 2016), https://doi.org/10.1596/978-1-4648-0671-1.

As Library For All has scaled, however, the evidence around the potential positive impacts of digital literacy solutions has moved beyond this foundational impetus. For example, providing books in digital format contributes to their preservation and ongoing circulation. Document digitization is a priority globally due to the potential impacts of climate change on remote repositories (see, for example, the British Library's Endangered Archives program).[4]

In educational interventions by government bodies and international non-government organisations (INGOs), books are often produced in small sets as a response to a specific program or funding arrangement. Once they are taken out of circulation due to the end of funding, or because the defined distribution arrangement is fulfilled, they are at risk of disappearing altogether.[5] Library For All includes digitization of existing locally published material wherever possible as a component of its library curation strategy, prolonging the benefits of earlier print publishing projects.

It is also easier to revise and update digital reading materials than print copies. This means material can be changed to accommodate shifts in cultural sensitivity, for example, or changes to formal orthographies of languages. It is also economical to produce multiple versions of an eBook in diverse languages. Without funding, and attentive curation, low-income libraries are unlikely to enact sustained re-evaluation and re-ordering of resources. In the Library For All model, revised ePub files are immediately visible to online users at no additional cost. For offline solutions, the library can be revised easily (pushing automated updates through LFA GroundClouds, for example) to provide the latest, or multiple, versions of books. This means schools and homes are accessing material in line with their educational and cultural needs, as opposed to potentially outdated print book series.

For schools and community centres, a digital library offers benefits in terms of storage and maintenance. Remote classrooms may not have the luxury of the enclosed spaces, controlled temperatures, or cataloguing tools that are optimally deployed to maintain and preserve a paper-based library. Dust, humidity, natural hazards, theft, and the impact of day-to-day handling of shared resources cause loss and damage to printed materials, and these are unlikely to be replaced. Added to this is the complexity of delivering printed materials to remote communities – freight expenses, taxes, transport limitations, environmental impediments – which may result in printed book shipments never reaching their intended recipients.

A digital library also offers potential for thousands of books to be made available in a school and regularly curated and updated with minimal additional expense or effort on the part of teachers or community leaders. In Papua New Guinea, for example, the Library For All Spark Digital Classroom Kit provides over 700 culturally relevant books along with automated Monitoring and Evaluation tools and, in the near future, curated, student-led, self-paced education apps, in portable, protective casing. There is no way of replicating this suite of tools in print for the same cost and ease of storage and delivery.

[4] "Endangered Archives Programme, British Library," accessed May 21, 2021, https://eap.bl.uk/about.
[5] "Best Practices for Developing Supplementary Reading Material." (USAID, 2014).

Why digital? Literacy outcomes

The practical benefits of delivering a digital library in a low-income environment outlined above are straightforward to determine and measure. The benefits to literacy advancement in low-income regions are harder to quantify given the widespread deficit in appropriate benchmarking and consistent application of comparative Monitoring and Evaluation programs. LFA is strategically addressing this with the data gathering methodologies earlier mentioned.

What we do know is that EdTech is increasingly supported in high-income countries, implying a general acceptance of the benefits of digital education. Even pre-COVID, the global EdTech industry was projected to have an estimated value of around $258 billion USD.[6] Paradoxically, when it comes to EdTech in the literacy space specifically, there can be resistance to giving early learners access to digital tools for fear of the negative impacts of too much 'screen time'.

Overexposure to screens comes with multiple areas of concern and ongoing research, including the impacts of light-emitting tools on sleep behaviours, and reduced oral language development.[7] But much of this research, and resultant commentary, concerns educational screen usage as part of an already high overall daily screen time calculation. The Australian Department of Health, for example, recommends no more than 2 hours of 'sedentary recreational screen time' per day excluding screen time needed for schoolwork.[8] But for many of LFA's program communities, where television viewing and internet usage have limited availability in the home, overall daily screen time is minimal, so an online or app-based intervention will not amplify screen time to problematic levels.

It should also be noted that conceptions of literacy have always changed as technology has changed. The printed book itself, of course, was once considered a radical and progressive technology.[9] A recent OECD report posits that literacy in the 21st century is not just about learning to read, but 'constructing and validating knowledge'.[10] For children today, across the globe, recognising letters and words must go hand in hand with additional skills, like visual and technological literacy. This has benefits for assisting students, over time, to develop their meta-cognitive skills and reading strategies – such as being able to identify online risks or unpack 'fake news'. Decoding words is only one facet of the overall aim in upskilling students to cope with, embrace, and enjoy education.[11]

But leaving aside all other socioeconomic variables, the same OECD[12] report consolidated considerable research around the literacy outcomes of digital reading versus print-based reading and found strongly

[6] Maya Escueta et al., "Education Technology: An Evidence-Based Review" (Cambridge, MA: National Bureau of Economic Research, August 2017), https://doi.org/10.3386/w23744.
[7] Jennifer Cross, "What Does Too Much Screen Time Do To Children's Brains," accessed May 21, 2021, https://healthmatters.nyp.org/what-does-too-much-screen-time-do-to-childrens-brains/.
[8] "Physical Activity And Exercise Guidelines For All Australians," n.d., https://www.health.gov.au/health-topics/physical-activity-and-exercise/physical-activity-and-exercise-guidelines-for-all-australians/for-children-and-young-people-5-to-17-years.
[9] Karen McLean, "Literacy and Technology in the Early Years of Education: Looking to the Familiar to Inform Educator Practice," Australasian Journal of Early Childhood 38, no. 4 (December 2013): 30–41, https://doi.org/10.1177/183693911303800405.
[10] OECD, "21st-Century Readers: Developing Literacy Skills in a Digital World" (OECD, May 4, 2021), https://doi.org/10.1787/a83d84cb-en.
[11] McLean, "Literacy and Technology in the Early Years of Education."
[12] OECD, "21st-Century Readers."

in favour of print. It showed that students who read printed books more frequently perform better in reading, spend more time reading, and enjoy reading more than students who read more often from digital devices. Reports such as this one quickly make headlines and appeal to traditional education programs. But the complexity of global literacy amelioration activities, particularly in low-income and remote environments, requires us to go beyond the bullet points.

For example, the OECD data consistently shows that engagement in reading is strongly correlated with reading performance, mediating the effects of other variables such as socioeconomic status and gender. Not speaking the language of instruction at home represents an additional barrier to attaining high proficiency in reading.[13] In this way, a varied, high engagement, multilingual digital library is considerably more valuable than a stagnant print library. Significantly, whilst 36 countries in this study showed a negative relationship between reading performance and time spent on using digital devices, the opposite was true in certain countries, including Australia, suggesting myriad variables are at play in terms of the ways in which students interact with digital education.[14]

In terms of the mechanics of learning to read, research is variable and ongoing, particularly where younger cohorts are concerned. Multiple studies confirm that reading linear narratives on a screen results in lower comprehension results.[15] Potential disrupters here include the distraction of needing to scroll or swipe between blocks of content, and the disjointed page layouts of some ePubs. This too, however, is inconsistent across studies. For example, outcomes depend on which language the user is familiar with; some languages are far easier to acquire by digital intervention alone, depending on variables such as silent letters and phonic patterns.[16]

Other research focuses on concentration (whereby some reports suggest online learning decreases focus and attention spans), and a potential reduction in fine motor skills, with a flow-on effect to handwriting adoption. For example, in a gamified tool where the only action required to recognise or reproduce a letter is tapping, there is no improvement in 'graphomotor skills'. This, in turn, results in lower levels of letter recognition.[17]

Once again, however, these results do not point to digital learning being 'good' or 'bad'; they point to a need for considered design of online tools and implementation. LFA's Elevate product includes eBooks, read along books, and interactive games such as manual letter tracing and puzzle play. This provides multimodal and tactile interactive learning. Productive gamification is achieved 'not when learning is

[13] OECD.
[14] OECD.
[15] Anne Mangen, Bente R. Walgermo, and Kolbjørn Brønnick, "Reading Linear Texts on Paper versus Computer Screen: Effects on Reading Comprehension," International Journal of Educational Research 58 (January 2013): 61–68, https://doi.org/10.1016/j.ijer.2012.12.002.
[16] Heikki Juhani Lyytinen et al., "Supporting Acquisition of Spelling Skills in Different Orthographies Using an Empirically Validated Digital Learning Environment," Frontiers in Psychology 12 (April 6, 2021): 566220, https://doi.org/10.3389/fpsyg.2021.566220.
[17] Evan D. Chinoy, Jeanne F. Duffy, and Charles A. Czeisler, "Unrestricted Evening Use of Light-Emitting Tablet Computers Delays Self-Selected Bedtime and Disrupts Circadian Timing and Alertness," Physiological Reports 6, no. 10 (May 2018): e13692, https://doi.org/10.14814/phy2.13692.

changed into a computer game but rather when adding a design layer of game elements to enhance learning, increase engagement, and encourage positive behavior'.[18]

Conclusion

There has been minimal research conducted into the impacts of digital reading versus paper reading in the world's poorest communities. With the impacts of COVID necessitating rapid responses, including digital interventions, there is likely to be considerable research output in this area in the years ahead.

While considerable evidence suggests that literacy, particularly as relates to comprehension, is more effectively taught on paper, it is equally true to say that offering students access to plentiful, engaging material, in a language they recognise, reaps rewards. LFA brings communities a diverse, relevant library, alongside student-led, gamified tools, in a secure technological environment. Based on this review of the current thinking around digital education, digital delivery of books and educational materials, particularly with conscientious curation and user-focused design elements, makes sense in communities where access to print materials is unaffordable or otherwise unavailable.

About the Working Paper Series

This Working Paper was published by Library For All as part of our evidence-based approach to the design and delivery of educational resources. Papers in this series showcase the quantitative, qualitative, and speculative research activities that inform our operations, from product development to program delivery. Read more from this series at libraryforall.org.

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Dr Cain Gray is an authority on cross-cultural library collection management. She brings specialist knowledge of translation and adaptation methodologies, and culturally specific publishing agendas, to her curatorial oversight of LFA's publishing operations.

Dr Cain Gray advises Library For All's global network of authors, illustrators, translators and cultural advisors, providing training and support for title creation, ensuring every title is relevant, age-appropriate, and high quality.

[18] Raed S. Alsawaier, "The Effect of Gamification on Motivation and Engagement," The International Journal of Information and Learning Technology 35, no. 1 (January 2, 2018): 56–79, https://doi.org/10.1108/IJILT-02-2017-0009.

We won't stop until every child can learn, does learn and enjoys learning.

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