MEASURING PUBLIC LIBRARY IMPACT ON EARLY CHILDHOOD DIGITAL LITERACY

Dilnavozxon Iqboljon-qizi Soliyeva
Scientific advisor: Rashid Turgunbayev
Kokand State University

Abstract: As digital media become embedded in early childhood environments, public libraries have emerged as critical, though often unmeasured, actors in shaping foundational digital literacy skills. This article examines the methodological challenges and opportunities in assessing how library programs, collections, and informal learning spaces affect children from birth to age eight. Drawing on recent evaluation frameworks from the United States, the United Kingdom, and Australia, the article proposes a multi-layered impact model that distinguishes between access effects, adult mediation effects, and developmental outcomes. The argument advanced is that traditional output measures such as program attendance or device usage are insufficient for capturing digital literacy gains. Instead, libraries must adopt observational instruments, parent-reported competency scales, and longitudinal tracking of digital behaviors. The article concludes with practical recommendations for library practitioners seeking to implement low-cost, high-reliability measurement strategies without overburdening staff or compromising the playful nature of early learning.

Keywords: early childhood digital literacy, public library impact measurement, joint media engagement, developmental outcomes, observational assessment, adult mediation

Introduction

The first eight years of a child's life constitute a sensitive period for cognitive, social, and linguistic development. During this window, children acquire not only print literacy but also the rudiments of digital literacy: the ability to navigate age-appropriate interfaces, understand cause and effect in digital environments, recognize symbols and icons, and begin to differentiate between information and entertainment. While much public discourse has focused on screen time limits and the risks of digital overexposure, a quieter but more constructive conversation has emerged around the quality of digital interactions. Public libraries, historically positioned as guarantors of literacy and equal access to information, have been quietly reinventing themselves as digital literacy incubators for the very young.

Yet for all the storytime apps, coding workshops for preschoolers, and tablet lending programs, the library profession lacks robust, standardized methods for measuring how these services affect early childhood digital literacy. Librarians can report how many families attended a digital storytime, but they cannot easily say whether participating children showed improved ability to swipe, tap, or follow a touchscreen narrative. They can note the circulation of digital play tablets, but they struggle to document changes in a child's ability to use voice search or recognize a hyperlink. This measurement gap is not merely an academic problem. Without credible impact data, library directors face difficulty justifying digital literacy programs to municipal funders, and researchers cannot compare interventions across different library systems.

More critically, libraries cannot iteratively improve their offerings if they do not know which specific program components drive learning.

This article addresses the measurement gap by asking a deceptively simple question: how can public libraries reliably measure their impact on early childhood digital literacy? The answer, as we shall see, requires moving beyond simple attendance and satisfaction surveys toward a structured framework that accounts for the unique developmental characteristics of young children, the mediating role of parents and caregivers, and the resource constraints of typical public libraries. The goal is not to propose a one-size-fits-all instrument but to equip library practitioners and researchers with a conceptual toolkit for designing evaluations that are both rigorous and feasible.

The Conceptual Landscape of Early Digital Literacy

Any measurement effort must begin with a clear definition of the construct being measured. Early childhood digital literacy is not a miniature version of adult digital literacy. Adults need to evaluate source credibility, manage privacy settings, and troubleshoot connectivity issues. Children under eight, by contrast, are building what developmental psychologists call foundational affordance awareness: the understanding that digital objects behave in predictable ways. A three-year-old who learns that tapping a cartoon rabbit makes it squeak is exhibiting digital literacy at a rudimentary level. A five-year-old who can independently open a drawing app, select a brush color, and undo a mistake is demonstrating procedural digital literacy. A seven-year-old who asks a librarian whether a website's information comes from a real person or a robot is showing the first stirrings of critical digital literacy.

Researchers in the field of children's human-computer interaction have identified several component skills that constitute early digital literacy. These include motor skills such as precise tapping, dragging, and pinch-to-zoom; navigational skills such as locating the home button, closing pop-ups, and switching between apps; symbolic understanding such as interpreting icons for save, print, and share; and basic safety awareness such as knowing to ask an adult before clicking unfamiliar links. Importantly, these skills do not develop in isolation. They are heavily scaffolded by what educational researchers call joint media engagement, wherein an adult or older child co-uses a digital device with the young child, providing verbal guidance, asking questions, and modeling appropriate behavior. Public libraries are uniquely positioned to foster joint media engagement because they bring together children, caregivers, and curated digital resources in a low-stakes, community-oriented environment.

However, the library context also complicates measurement. Unlike a classroom, where a teacher works with the same children daily, library programs often serve transient populations. A family may attend a digital literacy session once and never return, or they may drop in irregularly. This mobility makes pretest-posttest designs difficult. Furthermore, digital literacy development occurs in small, incremental steps that are hard to capture with standardized tests designed for older children. A child who hesitantly touches a screen for the first time under a librarian's encouragement has made genuine progress, but that progress will not register on a multiple-choice assessment.

Why Traditional Library Metrics Fall Short

Most public libraries currently rely on what might be termed convenience metrics. They count the number of tablets lent, the number of children attending coding storytimes, or the

number of times a digital literacy handout is downloaded. These output measures are easy to collect and useful for demonstrating activity levels, but they tell us nothing about learning. A child can attend a digital storytime while passively watching a screen, without acquiring any new skill. A family can borrow a tablet every week without ever engaging in joint media mediation. Moreover, convenience metrics create perverse incentives. A librarian whose performance is judged solely on program attendance numbers has little motivation to design more demanding, interactive sessions that might be more educational but also more likely to have smaller, more focused groups.

Satisfaction surveys, another common tool, are similarly limited. Parents who attend library programs generally report high satisfaction regardless of educational impact, partly due to gratitude for free community services and partly due to social desirability bias. A parent who admits that their child did not learn anything from a librarian-led activity may feel they are criticizing the library. Satisfaction surveys also cannot capture the specific mechanisms of learning. Parents might report that they enjoyed a digital storytelling session without being able to articulate whether their child improved in narrative comprehension, icon recognition, or fine motor control.

Some libraries have attempted to use commercially available early literacy assessments, such as the Get Ready to Read screening tool or the Phonological Awareness Literacy Screening for Preschoolers. While these instruments measure print-related pre-reading skills, they do not assess digital literacy competencies. A child with strong print literacy may nevertheless struggle with touchscreen navigation if they lack prior exposure. Conversely, a child with extensive digital experience may still need support in translating digital narrative comprehension to print reading. Libraries need measures that are specifically designed for the digital domain.

Toward a Multi-Layered Impact Model

Given the shortcomings of single-metric approaches, this article proposes a multi-layered impact model that distinguishes between three levels of library effect. The first level is access effects, which refer to whether a library's digital resources actually reach young children and their families. Access effects can be measured through device circulation data, the diversity of borrowing households by neighborhood income and language background, and the frequency of in-library digital play observed during unstaffed hours. The second level is adult mediation effects, which capture how library programs and resources influence parent or caregiver behavior. Mediation effects include changes in how often adults co-use digital devices with their children at home, how many different types of digital activities they engage in together, and the adult's confidence in selecting developmentally appropriate apps. The third level is developmental outcomes, which are the observable digital literacy skills that children display following library exposure. These can be measured at the motor level, such as successful tapping and dragging; the procedural level, such as opening and closing an app independently; and the cognitive level, such as following a two-step digital instruction.

Each level requires different measurement instruments. Access effects can be tracked through existing library management systems, supplemented by brief exit surveys that ask families where they learned about the library's digital resources. Adult mediation effects are best captured through parent-reported logs or pre- and post-program questionnaires that ask specific, behaviorally anchored questions. For example, rather than asking "Did your child learn digital

skills?", a well-designed parent questionnaire might ask, "In the past week, how many times did your child use a touchscreen device with you sitting next to them and talking about what they were doing?" or "Please indicate which of the following actions you have seen your child do independently: tap an icon, swipe between screens, close a pop-up ad." Developmental outcomes for children require observational approaches, which bring us to a more challenging methodological territory.

Practical Observation Strategies for Library Settings

Direct observation of young children's digital literacy behaviors is possible even in busy, understaffed libraries, provided that observation protocols are designed for efficiency. One promising method is the structured task observation, in which a librarian or trained volunteer presents a child with a short, game-like digital task on a library tablet and records a small number of discrete behaviors. For instance, a child might be shown a simple drawing app and asked to make a red circle. The observer notes whether the child can locate the color palette, select red, choose the circle tool, and draw on the screen. This entire observation takes under two minutes and can be conducted in a corner of the children's area without disrupting other activities. Over a period of weeks, aggregated observations can show whether children who have attended a library digital literacy program are more likely to complete such tasks successfully than children in a comparison group.

Another low-burden strategy is the use of video snippets. With appropriate consent from parents, librarians can record thirty-second clips of children engaging with digital storytime apps or coding toys. These clips can be coded later by a single staff member using a simple rubric that scores for on-task behavior, independent navigation, and use of help-seeking strategies. The key is to keep the coding scheme extremely simple, with no more than three to five items. Libraries should avoid the temptation to create elaborate coding systems that produce rich data but require hours of staff time per clip.

For libraries with more resources, a third observational method is the integration of digital traces. Some educational apps designed for early childhood, such as those from the PBS KIDS series or the ScratchJr programming environment, can export anonymized usage logs showing which features a child used, how many attempts were needed to complete a task, and whether the child escalated to harder difficulty levels. Libraries that lend pre-loaded tablets can, with appropriate privacy safeguards and parental opt-in, collect these logs as a form of naturalistic assessment. The child is not aware of being measured, yet the data provide a fine-grained picture of skill development over multiple sessions.

Addressing Implementation Barriers

Practical measurement efforts face three common barriers that libraries must proactively address. The first is staff time. Children's librarians are already stretched thin, and adding systematic observation or data entry to their duties may provoke resistance. The solution is to embed measurement into existing routines. For example, the final five minutes of a digital storytime can be repurposed as a group observation period, during which librarians note on a simple checklist how many children independently turned on a tablet, how many asked for help, and how many successfully navigated to the story app. Alternatively, libraries can recruit volunteers or undergraduate students from local education programs to serve as observation assistants, providing them with service-learning credit in exchange for data collection.

The second barrier is privacy and parental consent. Measuring young children's digital behaviors raises legitimate concerns about data security, especially given that many libraries serve vulnerable populations including immigrant families and low-income households. Libraries must develop clear, plain-language consent processes that explain exactly what data will be collected, how long it will be retained, and who will have access. Importantly, families should be given the option to participate in programs without being included in measurement. The measurement protocol should also avoid collecting any personally identifiable information beyond a unique, non-reversible code. Video recording, if used, should be subject to additional safeguards such as face-blurring technology and automatic deletion after coding.

The third barrier is the difficulty of establishing causation rather than mere correlation. If a library observes that children who attend digital literacy programs have better tablet navigation skills than children who do not attend, the cause may not be the program itself. Perhaps families who enroll in library programs are already more engaged in their children's digital learning at home. The classic solution to this selection bias is randomized assignment, but randomizing access to library programs is ethically questionable for a public good. A practical alternative is the waitlist control design, in which families register for a high-demand digital literacy program and are randomly assigned to either immediate participation or a one-month delay. The delayed group serves as a control, and their digital literacy skills can be measured before they receive the program, providing a baseline for comparison.

From Measurement to Program Improvement

The ultimate purpose of measuring impact is not to produce a report for funders, though that is a valid secondary goal. The primary purpose is to enable iterative program design. Suppose a library measures the effect of a tablet-based storytime and finds that children show improvements in tapping and swiping but no improvement in following narrative sequence. This pattern suggests that the storytime may be overemphasizing isolated motor practice at the expense of comprehension. The librarian could then redesign the session to include more dialogic questioning, such as pausing the digital story to ask "What do you think happens next?" and checking whether children can swipe back to find a clue. The same measurement instrument, applied again after the redesign, can test whether comprehension scores improve.

Similarly, if parent-reported logs show that adults rarely use the library's recommended app list at home, the library might discover that the recommended apps are not actually free or that they require WiFi connections which some families lack. The measurement data point to a material barrier rather than a motivational one. The library can respond by pre-loading tablets with fully offline apps and by offering take-home guides that show free alternatives. In this way, measurement becomes a feedback loop rather than a one-time audit.

Conclusion

Public libraries cannot assume that good intentions translate into measurable outcomes. The rise of digital media in early childhood demands that librarians become not only providers of technology but also critical assessors of its developmental effects. Measuring the impact of library services on early childhood digital literacy is difficult, but it is not impossible. By moving beyond attendance counts and satisfaction surveys, and by adopting a multi-layered model that distinguishes access, adult mediation, and developmental outcomes, libraries can construct measurement systems that are both rigorous and feasible. Simple observational rubrics, parent-

reported behavior logs, and the careful use of digital traces provide a toolkit for librarians working with limited budgets. The path forward requires a cultural shift within the profession: from valuing activity to valuing learning, from counting inputs to documenting change. For the young children who will grow up in a world where digital literacy is as foundational as print literacy, that shift is not merely desirable. It is a responsibility.

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