

# From Search for Children to Children as Searchers

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## Abstract

Search engines increasingly influence children’s learning. Yet most of these systems continue to treat them as miniature adults rather than developing learners. Building on previous child-oriented Information Retrieval and Child-Computer Interaction literature, our work aims at redefining the role of children as active searchers, integrating the principles of scaffolding and Search-as-Learning.

## CCS Concepts

• **Human-centered computing** → HCI; • **Information Systems** → *Information Retrieval*.

## Keywords

HCI, Children, Search, Search-as-Learning, Information Retrieval

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## 1 Introduction

Over the past two decades, online searching has become increasingly popular among children, whether for leisure or educational purposes [34]. However, the vast majority of search tools—particularly popular Search Engines (SE) like Google—are designed primarily with adults in mind [25], not necessarily accounting for children’s distinct search behaviors stemming from their in-development cognitive, linguistic, and information literacy skills [23, 30, 31, 36]. Early Information Retrieval (IR) research for which children were the main stakeholders attempted to address this gap by exploring how to design IR-related algorithms and interfaces that take into consideration children’s search needs [e.g., 6, 10, 14, 20].

The common focus among the aforementioned works is ultimately the simplification of the search process for children rather than helping them learn how to search effectively. With project SOL (Scaffolding to foster independence when children search Online for Learning), we move beyond the premise of designing tailored search tools for children and shift the focus towards child-aware technologies designed with and for children as active participants of the search process. Taking inspiration from the scaffolding metaphor used in education to support new skill development

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[35], we explore whether and how technological solutions (interfaces and algorithms) can be integrated into popular SE to teach children best information access practices while also facilitating completion of education-related inquiry tasks.

## 2 The Evolution of Child-Oriented IR Systems

Since the late 1990s, with the proliferation of home computers, children’s exposure to online content has drastically increased [22]. However, early empirical explorations of children’s search interactions using mainstream SE revealed several algorithmic limitations that hindered children’s access to resources suitable for them [7–11, 33]. *Yahooligans!* was the first commercial attempt to provide young searchers with safe access to online information through a child-friendly SE [30]. Subsequently, more child-centric tools emerged on the market, such as KidzSearch, a web platform based on Google’s Safe Search and an added filter based on community feedback. Yet, the underlying idea of these systems was similar: providing a commercial solution to filter adult-level content [19]. In parallel, the research community began exploring ways to better meet children’s specific search needs. The PuppyIR project, launched in 2009, played a significant role in expanding the scope of child-IR [14]. As an open-source framework, Puppy IR helped researchers to study how IR systems could be better designed to meet children’s needs, highlighting key differences between children’s and adults’ search behaviors [e.g., 3–6]. In response, researchers designed, developed, and assessed several new IR strategies to enable, for example, the detection of children’s search intent [17] or the generation of child-tailored query suggestions [15, 16, 27]. While these efforts advanced children’s IR by operationalising the PuppyIR framework through child-tailored IR modules, the strategies either assumed that the system would be able to detect that the user is a child from a specific school grade [28] or were implemented and assessed on a child-tailored search system [2, 15, 16]. Alongside research advances, market-driven solutions recognized search systems as a powerful tool for children’s educational purposes. Examples such as WizeNoze, an easily searchable repository of children-tailored material that aligns with educational goals, moved beyond being a simple SE to provide curriculum-aligned experiences designed to help children find information online. Despite these efforts, many children still prefer using mainstream SE like Google [26], which highlights a critical gap among past research: while children’s skills in information literacy, spelling, and language are still developing [13], existing child-friendly systems fail to fully address their evolving search needs. Research projects and workshop series advanced this knowledge gap by arguing for adaptive and more ethical frameworks for driving the design of children’s search tools, evidencing that embedding educational context into search tools requires more than just aligning content with curricula. For instance, Child Adaptive Search Tool (CAST) dynamically adapts search results to users’ literacy levels and developmental needs [1]; the **KidRec** workshop brings together interdisciplinary experts to discuss pedagogical, ethical, and technical aspects of designing information access systems for children [24, 29], emphasizing to

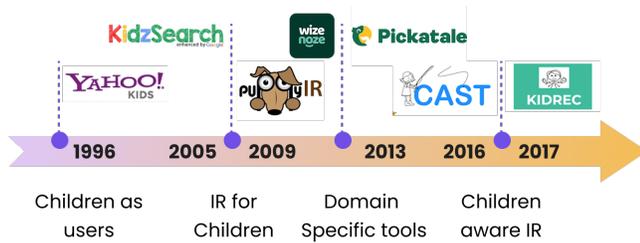


Figure 1: A timeline for Children IR

the community that technological improvement should be aligned with educational guidance. Figure 1 summarizes this evolution: the shift of Children IR from early access-based systems towards more adaptive child-aware IR frameworks. Yet, a crucial dimension remains unexplored: not only how children search, but how they learn to search.

### 3 Scaffolding Children's Online Search

Despite notable progress on child-oriented IR systems, most research still focuses on supporting children to find information more easily, rather than fostering independent search skills [32]. This raises a fundamental question: *How can we evolve from supporting children's search activities to promoting their search skills?* Addressing this requires moving beyond just technical solutions towards the integration of pedagogical principles, such as scaffolding [35] and Search-As-Learning (SAL) paradigm [12]. In the educational context, *scaffolding* provides a support structure to enable new skill development and assists in moment-to-moment interactions [35]. In the context of IR, the SAL paradigm offers a theoretical foundation to study how individuals learn while they are searching [21]. The SOL project integrates scaffolding and SAL into the process of searching for online resources in the classroom, emulating the natural scaffolding offered in that context by providing an interface and algorithmic bridges that facilitate the completion of curriculum-related inquiry tasks while teaching children best practices regarding information access. While the Child Computer Interaction (CCI), Human-Computer Interaction (HCI), and IR communities have moved children's search research forward, we argue that studying this issue in silos prevents the practical adoption of theoretical solutions. With that in mind, we envision SOL as an iterative and interdisciplinary project where experts from HCI and IR, alongside partners with education, media literacy, and industry expertise, work cooperatively to ensure that interface and algorithm advances complement each other and do not disrupt the learning environment. The primary goal of SOL is to guide children's gradual transition toward autonomy through a form of guidance that evolves and decreases over time. Beyond its educational focus, SOL encourages a rethinking of how to involve children as design partners [18, 30]. By including children in collaborative activities, we capture their evolving strategies, frustrations, and methods of digital inquiry and make them protagonists in the design of their search as a learning experience.

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