

Report on International Workshops on Investigating Learning During Web Search

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Abstract

The IWILDS workshop series has undergone five iterations and aims to provide an interdisciplinary forum for researchers in search-as-learning, spanning information retrieval, learning sciences, psychology, and human–computer interaction. Over the years, its scope has evolved alongside developments in the search-as-learning domain, expanding from traditional search engines to more diverse Web-based learning environments, including generative AI-based conversational systems. Through diverse interaction formats, IWILDS has served as a venue for presenting research contributions and work-in-progress, fostering methodological discussions, and identifying emerging research priorities. The series has connected researchers and established a sustainable interdisciplinary research community on Web-based learning. The rapidly transforming technological landscape creates new opportunities and challenges for understanding online human learning behavior, and the fundamental questions raised by these changes will continue to shape future IWILDS workshops.

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Website: <https://iwilds2025.wordpress.com/>.

1 Introduction

The *International Workshop on Investigating Learning During Web Search* (IWILDS) series was developed by an interdisciplinary researcher team in response to the growing need to understand how people learn through online information interactions, a topic that spans information retrieval, learning sciences, psychology, and human–computer interaction [Vakkari, 2016]. As digital environments have become central to everyday inquiry, researchers have sought to explain how users navigate complex information spaces, construct knowledge, and regulate their learning processes [e.g. Zhou, 2023; Desai and Chin, 2020; Smith and Rieh, 2019; Liu and Jung, 2021].

The motivation for IWILDS emerged from the recognition that traditional models of search behavior were insufficient for capturing the cognitive and metacognitive dimensions of learning that unfold during online inquiry. Across its editions, the workshop has provided a dedicated venue for examining these questions, documenting how learning on the Web evolves alongside changes in interfaces, content formats, and algorithmic infrastructures. This longitudinal perspective reveals how the community has progressively expanded its conceptualization of search as learning, from early focus on search interfaces to broader investigations of multimedia environments, recommendation ecosystems, and conversational AI [Bilal et al., 2025].

The workshop series makes a sustained contribution by bringing together diverse disciplinary perspectives to shape a shared research agenda for this emerging field. Each edition has identified new methodological challenges, refined theoretical constructs, and surfaced practical implications for supporting learners in information-rich environments. The cumulative outcomes illustrate how the field has responded to shifting technological conditions, including the rapid integration of large language models that alter how users seek, evaluate, and synthesize information [Jia et al., 2023]. IWILDS has thus played a central role in articulating why Web-based learning demands rigorous empirical methods, interdisciplinary conceptual frameworks, and continuous re-examination of assumptions about learner behavior. Its importance lies in offering a stable intellectual home where researchers can collectively assess the implications of technological change, develop coherent approaches for studying complex learning processes, and chart future directions for a research area that continues to expand in scope and societal relevance.

2 Scope

The IWILDS workshop scope has evolved significantly alongside technological developments in the search as learning domain [Urgo et al., 2025; Rieh et al., 2016; Smith and Rieh, 2019; Ghosh et al., 2018]. Initially focused on traditional search engine interfaces, the workshop has progressively expanded to address the diversification of learning environments on the Web, encompassing multimedia platforms, social media, and recommendation systems. Most recently, the emergence of large language models and conversational AI has fundamentally transformed how learners interact with information, shifting from query-based retrieval to dialogue-based knowledge construction and AI facilitated guided learning [Tibau et al., 2024; Schneider et al., 2023; Wang et al., 2025].

The inaugural 2020 edition established the foundational focus on Web search as a ubiquitous learning activity, examining how individuals acquire and extend knowledge through online search. The workshop emphasized the interdisciplinary intersection of information retrieval, psychology, HCI, and educational sciences, addressing data collection methods, learning indicators, and bias in recommendation systems. The 2021 edition continued this foundation while introducing critical discussions on source evaluation and conceptualizations of search-as-learning itself.

The 2022 and 2023 editions marked a deliberate expansion beyond search-centric perspectives toward broader learning on the Web. This shift encompassed diverse media types and learning environments, examining relationships between querying, navigation, multimedia consumption, and learning outcomes. The scope broadened to include skill development outside traditional educational contexts, while maintaining focus on both formal and informal learning scenarios. The 2023 edition particularly emphasized that successful learning on the web requires high degrees of self-regulation, metacognition, and motivation, supported by adequate design of search, rec-

ommendation, and training systems. The workshop’s strategic co-location with different venues (SIGIR, CHIIR) reflected efforts to engage diverse communities, though the increasingly technical focus of contributions highlighted the complex challenge of sustaining truly interdisciplinary dialogue in this evolving research area.

The 2025 workshop reflected a fundamental transformation driven by large language models, focusing on ”navigation, discernment, induction, and synthesis” of ubiquitous information. The scope evolved from examining basic search behaviors toward understanding complex cognitive processes (metacognition, self-regulation) and the broader ecosystem of AI-powered tools needed to support learning in information-rich environments, directly addressing LLMs’ transformative impact on educational search and learning processes.

3 Previous Editions

IWILDS’20¹ [Hoppe et al., 2020] (October 2020, co-located with the ACM Conference on Information and Knowledge Management (CIKM)) was held as a virtual event and attracted approximately 30 participants. The full-day workshop features keynotes by Dr. Claudia Hauff (computer science, TU Delft) on supporting learning through interface adaptations and collaborative search, and Dr. Carita Kiili (psychology, Tampere University) on assessment tools for students’ online inquiry processes. Papers addressed knowledge change modeling, search history interfaces, educational video analysis, conversational interfaces, and vocabulary learning during search.

IWILDS’21² [Hoppe et al., 2021] (October 2021, co-located with CIKM) maintained about 30 participants in a virtual format. The workshop featured keynotes by Mônica Macedo-Rouet (education, University of Paris 8) on source evaluation in the search process and teaching adolescents to assess information credibility, and Catherine Smith (information science, Kent State University) on conceptualizing search-as-learning and examining what ”learning” means in different research contexts. Papers covered domain-specific user knowledge modeling, features for measuring knowledge gain during Web search, advances in video-based learning research, and triangulation perspectives on search as learning.

IWILDS’22³ [Hoppe et al., 2022] (July 2022, Madrid, Spain, co-located with the SIG conference on Information Retrieval (SIGIR)) was held in a hybrid format, drawing about 20 participants on-site, and five to ten participants online. The half-day workshop featured a keynote by Jaime Arguello on learning pathways and objectives, examining how different learning goals influence search behaviors. Papers covered learning-to-rank for knowledge gain, scaffolding children’s search, and predicting students’ academic success through their search behavior patterns.

¹Website: <https://iwilds2020.wordpress.com/>

²Website: <https://iwilds2021.wordpress.com/>

³Website: <https://iwilds2022.wordpress.com/>

IWILDS'23⁴ (March 2023, Austin, Texas, co-located with CHIIR) attracted approximately 15 participants on-site, and 5-10 online in a hybrid format. The full-day workshop included a keynote by Yan Zhang on consumer health information search as a learning process, an interactive practical session by Jeff Allen on sensemaking and team-based learning, and papers addressing privacy concerns in educational data collection and search behaviors in underrepresented Global South contexts.

IWILDS'25⁵ [Hoppe et al., 2025] (March 2025, Hannover, Germany, co-located with WSDM) had approximately 5 participants. The workshop featured one paper on video features for knowledge prediction and two invited talks explicitly addressing large language models: Simon Gottschalk on LLMs and RAG for educational search, and Gábor Kismihók on AI-empowered open education, followed by an extended interactive discussion session that proved valuable for addressing the considerable technological changes and their impact on the search as learning domain.

4 Outcomes

Over five editions, the IWILDS workshop has generated a consistent body of academic contributions while fostering interdisciplinary dialogue on Web-based learning. The workshop has produced 17 papers across its iterations, published through various venues to maximize accessibility and reach within the research community.

The workshop proceedings document the field's evolution from foundational search-as-learning research to contemporary challenges posed by AI integration. Topics have ranged from knowledge gain prediction and video-based learning to source evaluation, health information search, and most recently, LLM applications in educational contexts. The decreasing paper submissions in recent editions reflect both the field's maturation and the disruptive impact of rapid technological change, with researchers potentially needing more time to develop robust methodologies for studying AI-mediated learning environments.

Beyond formal publications, the workshop has served as a venue for presenting work-in-progress, fostering methodological discussions, and identifying emerging research priorities. The interactive format adopted in recent editions has proven particularly valuable for addressing fundamental questions about the field's future direction and terminology.

5 Impact

5.1 Community Building and Interdisciplinary Dialogue

The IWILDS workshop series has established a sustained forum for interdisciplinary collaboration at the intersection of information retrieval, educational psychology, human-computer interaction, and educational sciences. By rotating through different conference venues (CIKM, SIGIR, CHIIR, WSDM), the workshop has engaged diverse research communities and introduced

⁴Website: <https://iwilds2023.wordpress.com/>

⁵Website: <https://iwilds2025.wordpress.com/>

search-as-learning perspectives to audiences from Web mining, information retrieval, and HCI backgrounds.

The workshop has connected researchers across multiple institutions and countries, facilitating collaborations between computer scientists, educational researchers, and psychologists. This interdisciplinary exchange has been particularly valuable given the inherently cross-disciplinary nature of understanding how humans learn through online information interactions. The relatively intimate workshop format has enabled deeper discussions than typically possible in larger conference settings, with participants reporting valuable exchanges that influenced their subsequent research directions.

5.2 Research Impact and Field Development

The workshop has contributed to identifying and articulating key research challenges in Web-based learning. Early editions established foundational questions about measuring learning during search, understanding cognitive processes during information interaction, and designing systems to support learning objectives. Later editions recognized the need for more sophisticated frameworks addressing metacognition, self-regulation, and the complex ecosystem of tools supporting modern learners.

Most significantly, the 2025 edition positioned the community to address the fundamental transformation brought by large language models. Workshop discussions identified critical research priorities including the urgent need for new datasets capturing contemporary interaction patterns, development of novel assessment methodologies for AI-mediated learning, and attention to equity and access concerns. These priorities are already influencing research agendas within the community [cf. [Yu and Liu, 2025](#)].

The workshop has consistently emphasized methodological rigor and theoretical grounding, contributing to the field's maturation beyond purely technical approaches to incorporate insights from learning sciences and educational psychology. This emphasis on interdisciplinary methods has influenced how researchers design studies, select appropriate measures, and interpret findings about learning in digital environments.

5.3 Practical and Societal Impact

Workshop discussions have highlighted practical implications for educational technology design, emphasizing human-in-the-loop approaches that augment rather than replace human expertise. The focus on equity, access, and cultural considerations has raised awareness about potential risks of AI-enhanced learning environments exacerbating existing educational inequalities. These concerns have informed more thoughtful approaches to technology deployment in educational settings among workshop participants and their broader networks.

6 Outlook

The IWILDS workshop series faces both challenges and opportunities as it navigates a rapidly transforming technological landscape. The dramatic shift from traditional search interfaces to AI-mediated information access raises fundamental questions about the workshop's identity and scope.

As noted in the 2025 discussions, whether the field continues as "Search as Learning" or evolves into something broader—perhaps "Learning on the Web" or "AI-Mediated Learning"—remains an open question that the community must address collaboratively.

6.1 Near-term Priorities

The most immediate need involves developing methodologies and datasets that capture how users actually interact with contemporary AI systems for learning purposes. This requires systematic observation across diverse populations to understand generational, cultural, and socioeconomic variations in technology adoption and usage patterns. The workshop community is well-positioned to coordinate such efforts through collaborative data collection initiatives and shared methodological frameworks.

Assessment methodologies represent another critical priority. Traditional approaches to measuring learning may prove inadequate for AI-mediated environments where the boundaries between human and AI contributions blur. The workshop can serve as a venue for developing and validating novel assessment approaches that capture the collaborative nature of human-AI learning processes while maintaining focus on human learning outcomes.

6.2 Long-term Strategic Directions

The workshop must continue fostering genuine interdisciplinary collaboration, as understanding AI-mediated learning requires insights from multiple disciplines. Computer scientists bring technical expertise about AI capabilities and limitations; educational researchers contribute pedagogical frameworks and learning theory; psychologists offer insights into cognitive processes and human behavior; and domain experts from fields like health, science, and humanities provide context about discipline-specific learning needs.

Maintaining relevance requires the workshop to balance stability and adaptability. The core mission—understanding how humans learn through online information interactions—remains constant, but the specific technologies, behaviors, and research questions will continue evolving. The workshop must remain responsive to emerging developments while maintaining sufficient continuity to build cumulative knowledge.

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