

Rethinking Digital Health: Designing Learner-Centered Technologies for Health

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Abstract

As digital technologies become increasingly embedded in healthcare, ensuring equitable access to and engagement with digital health tools remains a pressing challenge. Many stakeholders - including clinicians, caregivers, and patients - struggle to navigate complex systems due to gaps in digital health literacy and contextual learning support. This paper first argues for a shift from conventional, one-size-fits-all approaches for meeting health information needs by taking on a learner-centered design perspective. We can design more effective tools by viewing users as proactive health-information seekers and active learners rather than passive recipients of health information. Furthermore, this paper argues in favor of participatory and speculative design methods to identify and address the evolving needs of diverse health-information seekers by surfacing the lived experiences often overlooked in traditional development pipelines. Lastly, this paper emphasizes the importance of building a sustained relationship between the interactive health research communities and health-information seekers and the can extend the life and relevance of digital health interventions. Through a series of provocations, this paper invites reflection on how Health+HCI research can foster meaningful engagement with digital health technologies in real-world contexts.

CCS Concepts

• **Human-centered computing** → **Human computer interaction (HCI)**.

Keywords

Digital health, Learner-centered design, Personal health data

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1 Introduction

In today's rapidly evolving healthcare landscape, digital health literacy [1] plays a critical role in ensuring that individuals can access, understand, and use digital health interventions effectively. Digital tools - such as electronic health records (EHRs), symptom

checkers, telehealth platforms, and mobile health applications - are increasingly embedded in healthcare systems, promising to improve access to information and facilitate better decision-making. However, despite these advancements, many individuals struggle to engage effectively with these technologies. The challenges arise not only from the complexity of digital tools but also from limited health literacy - a lack of understanding of medical terminology, the human body, or the implications of treatments. These barriers create a digital divide, making it more difficult for some individuals to benefit fully from digital health interventions.

The stakeholders affected by these challenges span across different roles in healthcare. Clinicians and nurses rely on digital systems for patient care but may find them cumbersome or time-consuming, diverting attention from patient interaction [6]. Home healthcare aides provide professional support outside clinical settings, yet they often lack the necessary training to leverage digital tools for better caregiving [10]. Primary caregivers, typically family members, navigate healthcare technology with even less guidance, struggling to interpret medical information or coordinate care [5]. These stakeholders interact with digital health interventions in diverse settings- hospitals, clinics, long-term care facilities, and homes - where their ability to effectively use these tools directly impacts patient well-being. However, there are potential usability barriers, lack of tailored information, and insufficient learning support.

Many initiatives focus on providing instructional resources, such as online tutorials, digital literacy workshops, and clinician-led training sessions to help users familiarize themselves with digital health tools [1]. However, these solutions assume that learning is a linear process and overlooks how people learn in context, make decisions under uncertainty, and interact with technology in real-world settings [8]. Instead of treating digital health literacy as a fixed skill to be taught, **what if we explored alternative design methods that adapt to health-information seekers' evolving needs?** Approaches such as critical design [2], speculative design [11], and participatory design [9] could provide new ways of engaging people with digital health interventions. In the following sections, I will explore these alternative strategies and their potential to reshape how we design for digital health literacy.

2 Understanding Health-Information Seekers Through the Lens of Learner-Centered Design

Health-information seekers are a diverse group, including clinicians, medical practitioners, nurses, therapists, home aides, caregivers, and patients themselves - each with distinct information needs, motivations, and challenges. While clinicians and healthcare professionals rely on structured medical knowledge and digital systems to inform decision-making [3], support providers, such as home

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aides, may require accessible, context-sensitive information about their clients' conditions to provide better care [10]. Family caregivers often find themselves navigating a vast landscape of medical literature and online health forums to support their loved ones [7]. Meanwhile, patients vary in their engagement with healthcare information - some take a highly active role in self-experimentation and quantified self-tracking, seeking autonomy over their care, while others prefer to collaborate or fully rely on clinicians due to literacy barriers, emotional distress, or accessibility challenges [3]. These differences in information-seeking behaviors highlight the need to move beyond viewing individuals as merely patients and instead recognize them as learners with distinct healthcare information needs.

Currently, health information resources do not always align with these diverse needs. For instance, home aides might desire more in-depth knowledge about chronic conditions to improve their caregiving, yet workplace training may not support or prioritize such learning [10]. Similarly, patients with rare or enigmatic conditions often find greater value in online communities and experiential knowledge-sharing than in formal medical literature, particularly when clinicians themselves have limited understanding [5]. This raises a critical question: **How can we design digital health tools that empower individuals to engage in self-directed learning, bridging gaps in access to knowledge and expertise?** A learner-centered design (LCD) approach in software development provides a compelling framework for addressing these challenges [8]. Unlike traditional user-centered design, which focuses on usability and task efficiency, LCD prioritizes the learning needs, motivations, and knowledge growth of users. In digital health contexts, this means designing interactive, adaptive, and context-aware technologies that support progressive learning, provide meaningful feedback, and accommodate different levels of expertise among information seekers.

Provocations: 1) How can we design digital health tools that support different learning trajectories for various stakeholders? 2) How can we integrate experiential, community and medical knowledge into digital interventions to enhance decision-making? 3) What role can self-monitoring technologies play in transforming passive information consumption into active learning experiences?

By shifting from a static, one-size-fits-all model of health information delivery to a dynamic, learner-centered approach, we can create more inclusive, empowering, and adaptable health technologies that truly meet the diverse information needs of patients, caregivers, and healthcare professionals.

3 Considering Alternative Research Methods for Designing Health Interventions: A Participatory Design Approach

The development of digital health interventions has traditionally followed top-down, expert-driven approaches, where technology is designed by researchers and clinicians with limited input from the actual end-users - patients, caregivers, and healthcare aides. Many existing health technologies, from electronic health records (EHRs) to self-tracking apps, focus on data collection and clinical efficiency but often fail to align with the lived experiences, priorities, and challenges of those who use them [3]. Participatory

design (PD) methods [9], in contrast, seek to address this gap by actively involving end-users in the design process, ensuring that interventions are tailored to their needs, preferences, and real-world contexts. Participatory design brings health-information seekers into the research and development process, allowing them to influence the design of interventions from the outset. Workshops, design probes, and speculative co-design studies in community spaces have the potential to let patients and caregivers contribute unique insights that traditional research methods may overlook. For instance, speculative design studies have been conducted in public spaces, such as community centers and festivals, where individuals interact with design probes in informal settings, allowing researchers to discover surprising insights which may not have emerged in typical care settings [4]. However, because health experiences are highly personal and context-dependent, researchers should prioritize replication studies, where similar participatory design interventions are conducted across different communities and demographic groups, ensuring that insights are not limited to a single cultural or social perspective. Additionally, critical design methods can complement PD by challenging conventional assumptions about health technology.

Provocations: 1) How can participatory design be scaled to reach diverse patient populations while maintaining depth in user engagement? 2) What role does speculative and critical design play in challenging the assumptions embedded in digital health technologies? 3) How can participatory research methods be documented more rigorously to support replication and comparison across studies?

By embracing participatory and critical design approaches, we can move beyond functionality-driven health technologies toward human-centered, reflective, and adaptive interventions that empower users in their health journeys.

4 Building a Community to Engage with Health-Information Seekers

One of the major challenges in Health+HCI research is the lack of infrastructure that enables researchers to consistently engage with health-information seekers [3]. Currently, recruitment for health-related studies is often ad hoc, relying on short-term collaborations with clinics, community organizations, or online forums. Once a study concludes, interventions are often abandoned, leaving participants without long-term access to tools that could otherwise benefit them. This cycle of temporary engagement risks eroding trust with patients, caregivers, and healthcare professionals, making future collaborations more difficult. To foster long-term engagement, we need to build sustainable and inclusive communities where researchers, designers, and end-users can collaborate beyond the duration of a single study.

A key approach to sustained engagement is the creation of digital platforms or community spaces where individuals can continuously contribute to and benefit from Health+HCI projects. For example, online hubs could serve as spaces where participants can track their progress, receive updates on ongoing research, and connect with others navigating similar health challenges. Additionally, rather than developing one-off prototypes, researchers should consider designing modular, open-source, or scalable health tools that can be

maintained and iterated upon after a study concludes. Regulatory and institutional support is also needed to ensure that research-generated tools are robust enough to remain in use post-study.

To earn and sustain trust, researchers must demonstrate long-term commitment to participants' well-being. This could involve co-designing exit strategies with communities to ensure a smooth transition if an intervention is discontinued. Additionally, partnerships with healthcare providers, advocacy groups, and patient-led organizations can help integrate digital health tools into existing support networks, ensuring their relevance and accessibility beyond the research phase. **Provocations:** 1) How can we design and implement digital health interventions that remain accessible and useful beyond a study's lifecycle? 2) What models of ongoing collaboration can Health+HCI researchers adopt to build trust with patients and caregivers? 3) How can regulatory frameworks support the maintenance and scaling of research-driven health technologies?

By shifting from short-term, study-bound interventions to sustainable, community-driven health technology ecosystems, Health+HCI research can create lasting impact for those seeking reliable, continuous engagement with their health information.

5 Conclusions

This paper highlights several key provocations that challenge the conventions in digital health intervention design. First, we need to rethink how we understand health-information seekers, recognizing them as learners with diverse needs, motivations, and barriers rather than passive recipients of information. Second, participatory and critical design approaches offer alternative research methods that center on the lived experiences of patients, caregivers, and healthcare professionals, ensuring that interventions align with real-world needs. Third, we must explore ways to blend self-tracked health data with experiential and community knowledge and medical expertise, allowing individuals to engage in meaningful decision-making about their health. Finally, to create sustainable, impactful digital health interventions, we must build long-term communities that engage with health-information seekers beyond the duration of research studies, ensuring continuous access to tools and support.

I hope these provocations will spark interesting conversations at the workshop around how learner-centered, participatory, and speculative approaches can help us toward more inclusive, adaptable, and empowering health technologies that serve the evolving health information needs of individuals and communities.

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