Designing and Evaluating Next-Generation Learning Interfaces: Linking AI, HCI, and the Learning Sciences

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Abstract. We propose to host the **full-day workshop** intended for the **AIED 2026** conference. Education is being reshaped by rapid advances in generative AI and immersive technologies, which offer unprecedented opportunities for scalable tutoring, personalized feedback, multimodal engagement, and new forms of human–AI collaboration, while also raising challenges such as over-reliance on AI-generated content, erosion of learner agency, issues of trust and bias, and accessibility in immersive environments. Addressing these opportunities and challenges is inherently interdisciplinary, requiring expertise from AI, Human-Computer Interaction (HCI), and learning sciences to ensure that emerging systems are both effective and responsible. This 2026 learning festival workshop brings together researchers from AI, HCI, and learning sciences communities to chart the future of next-generation learning interfaces. Through lightning talks, paper presentations, and collaborative activities, participants will share methods, examine the roles of humans and AI in complex learning scenarios, and identify research agendas that bridge theory and practice, with outcomes including a shared knowledge base of design strategies grounded in learning theory, a roadmap for evaluating emerging educational technologies, and a lasting interdisciplinary community at the intersection of AI, HCI, and education.

Keywords: Human Computer Interaction · Educational Technologies · Interface Design · Learning Environments

1 Introduction

New techniques, such as generative AI and immersive technologies (e.g., Augmented Reality (AR) and Virtual Reality (VR)), are transforming the way people

learn, teach, and collaborate across classrooms, homes, and workplaces. These technologies promise a step change in educational practice—on-demand tutoring at scale, personalized and adaptive content generation, multimodal engagement with text, code, images, and 3D environments, and new forms of collaboration where humans and AI co-create knowledge in shared physical–digital spaces. At the same time, their integration into education surfaces pressing challenges: balancing efficiency with learner agency, ensuring immersion without sacrificing accessibility, and building trust amid concerns of bias, privacy, and over-reliance on AI-generated content. Education stands at a critical juncture, where interaction design will determine whether these technologies empower or undermine learners and educators.

Momentum is evident across major research venues. NeurIPS, AAAI, and KDD now host workshops on AI for Education[8][9][10], while CHI has recently featured events on augmented educators and the future of work[11]. Learning sciences (ICLS/CSCL) and learning analytics (LAK) conferences have likewise advanced pedagogy, theory, and data-driven practices. For example, LAK hosted the workshop of LLMs for Qualitative Research [12] and a GenAI-LA workshop soliciting empirical studies [13]. Yet, despite this progress, human-centered approaches to designing educational technologies—particularly interfaces and interactions that mediate how learners and teachers engage with AI and immersive systems—remain underexplored.

Early successes with intelligent tutoring systems (ITSs) in domains such as mathematics [2] and computer science [10] demonstrate the promise of theoretically grounded educational technologies. These systems have delivered measurable learning gains by weaving together student-centered design, cognitive theory [2], and evidence-based practices [5], supported by data-driven approaches [3,6,10]. However, these systems typically rely on fixed interaction paradigms and tightly scripted interfaces, which limits their flexibility in supporting the open-ended, multimodal, and collaborative learning practices increasingly enabled by generative AI and immersive technologies.

Addressing these opportunities and challenges requires expertise that no single field can provide. HCI advances provide innovative interaction techniques and human-centered research methodoligies, as demonstrated by recent research on novel educational interfaces and interaction designs [11,8,12]. AI research contributes methods for adaptive modeling, natural language understanding, and generative content creation, providing the computational backbone that powers next-generation learning systems [7,9,4]. Learning sciences contribute theoretical and pedagogical foundations that ground technology design in thoery-based

[8] https://gaied.org/neurips2023/index.html
[9] https://ai4ed.cc/workshops/aaai2022
[10] https://ai-for-edu.github.io/workshop_kdd2024.html
[11] https://sites.google.com/view/augemted-educators-and-ai/home
[12] https://sites.google.com/view/lak-25-workshop-llms-for-qual/
[13] https://sites.google.com/monash.edu/genai-la-workshop-lak25/

practice [1]. Only by combining these perspectives can we design educational systems that are both rigorous and scalable.

This workshop convenes researchers from HCI, AI, learning sciences to forge new interdisciplinary pathways for next-generation learning technologies. Our aim is to collaboratively explore methods, theories, data infrastructures, and design practices that can guide the development and evaluation of educational interfaces at scale. Participants will build a shared knowledge base, exchange insights across fields, and identify best practices for designing systems that are human-friendly, technically sophisticated and pedagogically rigorous. In doing so, the workshop will help establish a cross-disciplinary community dedicated to shaping the future of learning technologies. The workshop is supported by BlossomAI[14], a startup developing AI-powered computing education tools, which provides funding for logistics.

2 Workshop Goals

The workshop has three specific aims, each accompanied by guiding questions to scaffold discussion and collaboration:

- **Engage AI and HCI researchers in educational design challenges.** We aim to encourage the application of novel interactive technologies (e.g., intelligent interfaces, immersive environments, and generative AI systems) to real learning contexts.
  - How can emerging interaction paradigms (e.g., multimodal input, embodied interaction) be adapted to support learning across diverse contexts?
  - What role should generative AI and immersive technologies play in complementing, rather than replacing, human teachers and peers?
  - How do we design for accessibility while introducing advanced technologies in classrooms, workplaces, or informal learning settings?
- **Introduce learning science theories and methods.** We aim to surface theories and approaches (e.g., student modeling, learning analytics, educational data mining) that can inform more data-driven and theoretically grounded interface and interaction design.
  - What learning theories (e.g., constructivism, cognitive apprenticeship) can most effectively guide design with generative AI and AR/VR?
  - How should we model learner knowledge, skills, and affect in real time, and how might these models adapt across modalities?
  - What ethical, privacy, and trust concerns emerge when collecting and analyzing large-scale learner data in immersive or AI-enhanced environments?
- **Bridge AI, HCI, and learning sciences communities.** We seek to inspire new collaborations and cross-community research agendas that advance both the design and the impact of educational technologies.

[14] `https://blossoms.ai/`

Table 1. Workshop Day Schedule

Session	Time	Activity / Description
Introduction	09:00–10:00	Workshop introduction and participants introduction, including their background, current work, and potential contribution (e.g., dataset, tool, design method).
Keynote	10:00–10:45	Invited keynote aligned with the workshop theme.
Spotlight Presentations I	10:45–12:00	Selected submissions (short talks): 8 min talk + 4 min feedback; quick survey after each to surface connections (methods, collaborators, evaluation ideas).
Lunch Break	12:00–14:00	Organizer-hosted group lunch near the venue.
Spotlight Presentations II	14:00–14:45	Continuation of selected submissions with the same format (about 10 total across both sessions).
Thematic Breakouts	14:45–15:45	Curated themes with facilitation and note-taking: (1) controllability of educational interfaces; (2) scalable feedback; (3) data & privacy; (4) evaluation paradigms; plenary share-out.
Speed Collaboration Rounds	16:00–16:45	Paired 10-minute exchanges across disciplines; rotate to surface concrete collaboration opportunities.
Closing Reflections	16:45–17:00	Synthesis of insights and next steps for continued collaboration.

- How can we create sustainable infrastructures and shared datasets that serve both HCI, AI, and learning sciences communities?
- What practices can help us balance methodological rigor from learning sciences with the rapid prototyping culture of HCI?
- How can collaborations between researchers, educators, and technologists be structured to ensure mutual benefit and long-term impact?

3 Workshop Plans and Activities

This **in-person full-day** workshop will bring together approximately 30 participants (including organizers). Participants will present their position/work-in-progress papers, engage with experienced mentors from AI, HCI, and learning sciences, and collaboratively explore challenges and opportunities in interdisciplinary educational technology research.

3.1 Pre-Workshop Activities

Recruitment We will invite researchers and practitioners interested in designing educational technology and interfaces (e.g., CHI, UIST, DIS), learning analytics, artificial intelligence, and learning sciences (e.g., EDM, AIED, LAK, ISLS, L@S) via mailing lists and social media (e.g., X, LinkedIn). A workshop website will provide essential details, including the call for participation, objectives, agenda, submission instructions, key dates, and the organizer's contact information.

Building on our growing network of contributors to prior workshops, we intend to solicit participation on the workshop through mailing lists and research networks in ACM special interest groups of SIGCHI and SIGCSE, as well as research communities such as European Association of Technology-Enhanced Learning (EATEL), User Modeling (UM), The International Educational Data Mining Society (IEDMS), The Society for Learning Analytics Research (SoLAR), and Relevant EU project consortia.

Call for Participation Participants are invited to submit position or work-in-progress papers that address 1) ongoing or prior research on system designs in educational contexts, or 2) challenges, questions, and ideas for the design of interdisciplinary educational technology. Papers will undergo peer review for quality and relevance. Selected submissions will be featured in brief presentations during the workshop.

Community Building Two weeks prior to the event, participants will join an online community (e.g., Google Group) to share their background, current work, and potential contribution (e.g., dataset, tool, design method) using a slides deck. Organizers will use participant interests to form interdisciplinary discussion groups via an online survey, facilitating deeper connections and collaborative idea development. Shared resources, including slides, Miro boards, and Google Drive folders, will support ongoing collaboration.

3.2 Workshop Planned Activities

Introduction (9:00 - 10:00) The workshop will begin with workshop introduction and then participants introduction. The host will play and introduce the slides deck about participants information.

Keynote (10:00 - 10:45): We will invite a keynote speaker to share insights related to the workshop theme.

Paper Presentation (10:45 - 12:00, 2:00 - 2:45) Following the keynote, 10 selected workshop submissions will be invited to present in a short spotlight format in two sections. Each presenter will have 8 minutes to share their work, followed by 4 minutes of feedback from the audience. A quick feedback survey will be given after each talk, encouraging attendees to identify interdisciplinary

connections and complementary methods that could improve the work, such as: potential collaborators, methods for improving data quality, expanded interface affordances or stakeholder considerations, or broader evaluation strategies.

Thematic Breakout Discussions: "Where Worlds Collide" (2:45 - 3:45) In the afternoon, we will organize a breakout session where participants will form small groups to discuss challenges and opportunities at the intersection of educational technology and user interface research. Each group will focus on one of several curated themes, including: (1) Controllability in educational interfaces - How we can enable educators or students to guide or refine AI behavior; (2) Scalable feedback mechanisms - How interface design can support timely and personalized feedback in large-scale learning environments; (3) Data and privacy - Balance the need for detailed educational data with transparency, consent, and trust; and (4) Evaluation paradigms - Understanding how HCI and EdTech communities approach evaluation differently, and what we can learn from each other. Each breakout group will be facilitated and will record key ideas to share in a whole-group reconvening session.

Speed Collaboration Rounds (4:00-4:45) To foster cross-community connections, we will host a speed collaboration activity. Participants from different disciplinary backgrounds will be paired for short, timed conversations. Each person will introduce their work and describe a specific problem they are trying to solve, followed by a short discussion of how their partner might contribute. For example, a participant working on educational data mining may offer a dataset and seek help designing an interface to visualize model output, while a HCI researcher may describe a novel interaction technique and ask for feedback on how it could be deployed in a classroom context. After each 10-minute round, the participants rotate to meet someone new.

Closing Reflections (4:45-5:00). We will conclude the workshop with a brief reflection session, where the organizers will summarize insights from the day and outline the next steps to continue the conversation beyond the workshop.

3.3 Post-Workshop Plans

Workshop Report We will create a concise report capturing key ideas, insights, and themes from presentations and group discussions. This report will include participant contributions and will be openly accessible online, providing a valuable resource for both attendees and the broader research community. Participants will also have the option to publish their position papers alongside the report on platforms such as arXiv.

Building a Lasting Community We will maintain the communication channels (Slack and Google Groups) to enable collaboration beyond the event itself. In

addition, participants will collaboratively review the workshop report, sustaining engagement and supporting lasting professional connections. We will also organize follow-up workshops at other AI, HCI, and learning sciences conferences to build the community across disciplines.

4 Organizers

Our organizing committee brings together an interdisciplinary group of scholars spanning HCI, AI, and the learning sciences. Collectively, the team has deep expertise in human–AI interaction, data visualization, programming support tools, real-time learning analytics, XR and mixed-reality learning environments, intelligent tutoring systems, collaborative and student-generated learning, computing education research, educational data mining, learning games, and large-scale educational platforms. This breadth positions the workshop to foster meaningful cross-disciplinary dialogue and advance both theory and practice.

Meng Xia is an Assistant Professor of Computer Science and Engineering at Texas A&M University. Her research focuses on Human–AI Interaction, Data Visualization, and Educational Technology, with publications at top venues including CHI, VIS, and CSCW. She will serve as the General Chair, coordinating all aspects of the workshop.

Yan Chen is an Assistant Professor of Computer Science at Virginia Tech. His work spans programming support tools, real-time learning analytics, and learning at scale, with a focus on interactive Human–AI systems for education. He will chair website development and technical infrastructure.

Qiao (Georgie) Jin is an Assistant Professor of Computer Science at North Carolina State University. Her research explores XR- and AI-driven mixed-reality tools to support teaching, learning, and social connection, particularly in real-world educational settings.

Yang Shi is an Assistant Professor of Computer Science at Utah State University. His research focuses on data-driven representations of program code for intelligent tutoring systems and student modeling in computing education, drawing on data mining and machine learning approaches.

Paul Denny is an ACM Distinguished Member and Professor at the University of Auckland whose work centers on collaborative learning and student-generated content in computing education. He is the creator of PeerWise, a large-scale platform used internationally, and brings extensive experience in building sustained research communities.

Tiffany Barnes is a Distinguished Professor of Computer Science at North Carolina State University. Her research focuses on computing education, educational data mining, and AI-supported learning environments. She will lead workshop outreach and community engagement, drawing on her extensive experience in inclusive computing initiatives.

Qingsong Wen is Head of AI and Chief Scientist at Squirrel Ai Learning and a PhD Supervisor at the University of Oxford. His research spans machine

learning, time-series analysis, and AI for education, with extensive leadership experience across major AI conferences and professional societies.

Vincent Aleven is a Professor at Carnegie Mellon University's Human-Computer Interaction Institute and Director of the CATS Lab. His work focuses on intelligent tutoring systems, learning analytics, and authoring tools for educational technologies. He will co-lead workshop dissemination and outreach.

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