Applications of Generative AI to Support Teaching and Learning in Higher Education: A Half-Day Workshop

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Abstract. Generative AI-based technologies offer new ways to engage students in personalized, inclusive, and interactive learning experiences. This includes applications such as course assistants, simulations, interactive activities, and tailored feedback on assignments. The goal of this half-day workshop is to share ongoing work in this rapidly evolving space and discuss what features of implementations contribute to successful adoption and use in university courses. Bringing together researchers, educators, and developers, we will showcase cutting-edge systems and empirical findings that examine the effectiveness of AI in higher education. Through presentations and group activities, participants will collaboratively identify emerging trends, challenges, and best practices. The workshop aims to synthesize insights into a set of recommendations to guide future research and implementation of AI-enhanced teaching and learning strategies.

Keywords: Higher education · Generative AI · Pedagogy · Teaching and Learning.

1 Motivation, Content, and Themes

Over the past three years, interest in generative AI (GenAI) at the AIED conference has grown exponentially, reflecting the emergence of innovative approaches to enhance teaching and learning. LLMs in particular open new opportunities to address ongoing challenges in this space and advance higher education practices.

While many of these interventions benefit education broadly, there remains a pressing need to examine their practical implications specifically within universities. Factors such as learner maturity, class sizes, subject areas, and instructor experience all play pivotal roles in shaping how GenAI can be most effectively deployed in this setting.

This half-day workshop therefore centers on the application of GenAI for supporting teaching and student learning in higher education. We aim to showcase how to develop and use GenAI interventions that empower instructors and students alike. Participants will learn strategies to successfully implement GenAI in their courses, engage in hands-on activities with relevant tools, and explore the broader opportunities that ongoing advancements in GenAI afford. We invite researchers, educators, and practitioners eager to expand and refine teaching and learning practices at the university level to join us. It will focus on exploring the opportunities and challenges of integrating GenAI in supporting teaching and learning in higher education teaching. Key topics and themes include:

AI Course Assistants – The use of AI-powered assistants or chatbots to support instructors and students in courses [5, 8, 3]. For example, AI teaching assistants can answer routine questions on discussion forums, as demonstrated by Georgia Tech's Jill Watson (an IBM Watson-based TA that handled forum Q&A in an online class) [2]. Such AI assistants can scale support for large classes, freeing human instructors for complex tasks. Notably, early trials showed students often didn't realize a responder was an AI, indicating these systems can effectively mimic helpful human support.

Feedback Generation and Automated Assessment – Techniques for leveraging GenAI to provide personalized feedback on student work. Large language models (LLMs) like Anthropic's Claude Sonnet, Google's Gemini 2.0, and OpenAI's GPT-4o can be used to generate formative feedback on essays, projects, or coding assignments. Recent research has explored using LLMs to write human-like feedback that is informative and encouraging for students [6, 9]. This theme examines how AI-generated feedback might improve learning by giving students timely, tailored guidance, as well as how instructors can curate or edit AI feedback to ensure quality. We will discuss scenarios such as AI tools that summarize a student's work and offer suggestions, helping instructors handle large classes or provide 24/7 support.

AI-Integrated Learning Activities – Design of learning activities and assignments that meaningfully incorporate AI tools. Rather than banning AI, some educators now require students to use AI for certain tasks to enhance learning. We will share use-cases like AI-assisted writing exercises, using AI to generate quiz questions or study guides, and creative projects where students collaborate with AI (e.g. using an AI as a brainstorming partner or a coding helper). This theme also covers how AI can personalize learning experiences by adapting content or practice questions to individual student needs, aligning with the goal of more inclusive and personalized education [11].

Challenges in Adoption – A critical look at the hurdles institutions and instructors face when incorporating GenAI into teaching. A primary concern is

the risk of students using AI to circumvent learning (e.g. getting answers or writing from AI without understanding) [7]. We will discuss academic integrity issues and strategies to prevent misuse, such as designing "AI-proof" assessments or teaching AI literacy so students use GenAI responsibly. Another challenge is faculty preparedness and training – not all educators are comfortable with AI, and many need guidance on effective integration. Technical limitations of current GenAI will be addressed as well, including the well-known tendency of LLMs to "hallucinate" (make up plausible-sounding but incorrect information), and how this impacts trust and accuracy in educational use. Participants will collaboratively consider solutions to these challenges.

Ethical and Inclusiveness Considerations – Throughout all topics, we will emphasize the ethical implications and the goal of equitable, inclusive education. This includes ensuring AI tools are fair and unbiased, respect student privacy, and are accessible to diverse student populations, which is a known challenge in this space [1, 4]. The workshop will explore questions like: How do we mitigate AI biases that could disadvantage or offend certain groups? How can GenAI be used to reduce barriers for marginalized students (for instance, providing extra tutoring support at no cost, or offering translations and adaptive content)? We will invoke guidelines on responsible AI in education, aligning with AIED 2025's theme of using AI to empower teachers and students for an equitable future. Case studies of ethical AI usage and policies (such as disclosure of AI use, data transparency, and obtaining consent for AI analysis of student data) will be discussed. Ultimately, this theme is about ensuring that GenAI is a positive catalyst for inclusion and ethics in the classroom rather than a source of new inequalities [10].

1.1 Significance and Relevance to the AIED Community

As GenAI continues to reshape education, university instructors and researchers are grappling with its potential to enhance learning while ensuring ethical and equitable integration. This workshop aligns with the AIED 2025 theme, *"AI as a Catalyst for Inclusive, Personalised, and Ethical Education,"* by examining how GenAI can be leveraged to empower both teachers and students in higher education.

In this workshop, we will discuss how AI can personalize learning, address diverse student needs, and reduce educational disparities. A key focus will be on ensuring ethical implementation, emphasizing fairness, transparency, and privacy in AI-based tools. By bringing together educators, researchers, and developers, this workshop will foster collaborative problem-solving on the challenges and opportunities of AI adoption in higher education, ensuring that these technologies serve as enablers of inclusive and equitable education rather than sources of bias or exclusion.

This workshop will contribute to the AIED community by synthesizing best practices, empirical insights, and future research directions for AI-driven teaching and learning. It will provide a critical forum for discussing how AI can

empower instructors, offer personalized support to students, and shape the next generation of ethical AI-enhanced education.

2 Proposed Timeline and Process

The call for papers will open on March 27, 2025, and the submission deadline will be May 29, 2025. The period from April through early May 2025 will be dedicated to workshop publicity and submission collection. Interested participants can submit **short papers** (4-6 pages) or **extended abstracts** (1-2 pages) describing their research, experience reports, demonstrations, or position statements related to GenAI in higher education teaching. The submission window of 6-8 weeks should provide authors with adequate preparation time. Submissions will be managed through EasyChair (or another system provided by AIED 2025). Our workshop program committee will conduct a thorough but prompt review process (approximately 2 weeks) following the submission deadline. Three members of the program committee will review each submitted paper. Authors will be notified of their paper acceptance on June 12, 2025. Accepted contributions may include papers for oral presentation, poster/demo descriptions, and lightning-talk proposals. Camera-ready versions will be requested by early July for any planned proceedings or online materials. In the weeks preceding the conference, specifically early July 2025, we will finalize the workshop schedule, organize accepted talks into thematic sessions, and confirm any invited speakers or panelists. The complete program will be published on the workshop website by early July and circulated to all registered participants along with any pre-reading materials.

We will actively **advertise the workshop** while accepting contributions. We will promote it through targeted email campaigns to the AIED community mailing list and related interest groups. Our team members will share the call for participation within their respective institutional networks and with colleagues at universities with strong AI in education research programs. All promotional materials will include the workshop's key themes, submission deadlines, and a link to the detailed workshop website.

3 Format and Activities

The workshop will follow an interactive and structured format designed to foster engagement and knowledge sharing among participants. As outlined in Table 1, the half-day event will include a combination of presentations, discussions, and hands-on group activities. This will be followed by a panel discussion on challenges, ethics, and implementation, addressing critical issues such as responsible AI use and academic integrity. The final session will involve an interactive group activity, where participants collaboratively design AI-powered interventions for education. The workshop will conclude with closing remarks and a discussion on future collaborations, ensuring that participants leave with actionable insights and connections for continued engagement.

Table 1. Half-day Workshop Schedule

Time	**Session**
09:00 - 09:20	**Introduction and Welcome** Overview of workshop objectives and introduction of organizers and attendees.
09:20 - 10:20	**Session 1: Presentations on Cutting-Edge Research** Selected short paper presentations highlighting recent research on AI course assistants, AI-generated feedback, and AI-integrated learning activities. Each talk will focus on the *design, implementation, and empirical evaluation* of AI-based educational tools. **Q&A and discussion after each presentation.**
10:20 - 10:35	**Break**
10:35 - 11:20	**Session 2: Challenges, Ethics, and Practical Implementation** Lightning talks and panel discussion featuring experts on: – Ensuring responsible and ethical AI usage in classrooms. – Institutional challenges in adopting AI tools for education. – Addressing student misuse, academic integrity, and faculty training. **Panel Q&A with audience participation.**
11:20 - 12:05	**Session 3: Interactive Group Activity – Designing AI-Integrated Learning Strategies** Participants will be divided into small groups to discuss and prototype AI-based interventions for their courses or research projects. Groups will explore: – How to design *effective AI-driven learning activities*. – Best practices for *AI-generated feedback* and student engagement. – Identifying potential risks and mitigation strategies. Each group will present their ideas in a **brief share-out session**.
12:05 - 12:20	**Closing Remarks and Next Steps** Summary of key takeaways, opportunities for future collaborations, and call for continued engagement.

4 People

4.1 Program Committee

The following researchers (in alphabetical order) will serve as the Workshop Program Committee to help shape the technical program:

- **Ryan Baker** is a Professor at the University of Pennsylvania and the Director of the Penn Center for Learning Analytics, specializing in Educational Data Mining and Learning Analytics. His research focuses on AI-driven models to analyze student learning behaviors and improve adaptive learning systems in digital education.
- **Christopher Brooks** is an Associate Professor at the University of Michigan and is an applied Computer Scientist who builds and studies the effects of educational technologies in higher education and informal learning environments.
- **Jadon Geathers** is a PhD student in Information Science at Cornell University, advised by Rene Kizilcec. His research examines how conversational AI can transform educational technologies through scalable practice opportunities, interactive dialogue, and automated feedback systems.
- **Yann Hicke** is a PhD student in Computer Science at Cornell University, advised by Claire Cardie and Rene Kizilcec. His research focuses on AI-driven conversational simulations, multimodal dialogue analysis, and adaptive feedback generation for training and assessment.
- **Rene Kizilcec** is an Associate Professor of Information Science at Cornell University, where he directs the Future of Learning Lab. He studies the design and deployment of AI in higher education, including AI-powered course assistants and simulation-based learning platforms.
- **Steven Moore** is a postdoctoral researcher at the Human-Computer Interaction Institute in the School of Computer Science at Carnegie Mellon University, advised by Dr. Ken Koedinger. His research is on learnersourcing, crowdsourcing, and human-AI partnerships.
- **Jiliang Tang** is a University Foundation Professor in the Computer Science and Engineering Department at Michigan State University. His research interests include graph machine learning, trustworthy AI, and their applications in biology and education.
- **Bo Wu** is an Associate Professor in the Department of Computer Science at Colorado School of Mines. He works on building efficient systems for machine learning and graph processing applications. He is the CEO and co-founder of HITA AI, an education AI platform for educators and students.

4.2 Potential Authors

We anticipate strong interest from researchers, educators, and developers working at the intersection of generative AI and higher education. Potential authors include those conducting empirical research on AI-powered teaching and learning, designing and evaluating AI course assistants, developing AI-driven feedback

systems, and implementing AI-integrated learning activities. Thus, contributions may come from:

- **Researchers** in Artificial Intelligence in Education (AIED), Learning Analytics (LAK), Learning at Scale (L@S), Educational Data Mining (EDM), Human-Computer Interaction (HCI), and Computer-Supported Collaborative Learning (CSCL), including researchers who study the pedagogical impact, ethical considerations, and effectiveness of AI-based tools in university settings.
- **Developers** and **Industry Researchers** who design and build AI-driven educational tools and who have insights into technical design, usability, and implementation challenges.
- **Policy and Ethics Experts** working on the responsible use of AI in education, ensuring that AI-based tools are fair, inclusive, transparent, and aligned with academic integrity standards.
- **Instructors** experimenting with AI in the classroom, who can share case studies on successful (and unsuccessful) AI integration into courses.

4.3 Workshop Audience

Beyond the program committee and potential authors, we anticipate interest in the workshop from members of the AIED, EDM, and L@S communities. The anticipated maximum number of participants is 40 people.

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