






# Equity, Diversity, and Inclusion in Educational Technology Research and Development

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**Abstract.** Modern education stands to greatly benefit from technological advances, especially in Artificial Intelligence (AI), that aim to enable effective and personalized learning for all students. However, to improve learning for the majority of students, AI solutions may exclude those who are under-represented due to unique differences in their demographic background or cognitive abilities. Towards combating this issue, we propose a workshop that will initiate conversations about equity, diversity, and inclusion in educational technology research and development. The workshop invites papers from the AIED community about equitable and inclusive educational technology that supports diverse populations, with selected authors being invited to present their work. The workshop is structured around three stages of learning engineering - system design, experimental study, and data analysis - with informational presentations, guest speakers, paper presentations, and group discussions relevant to each stage. Through the participation of community members from multiple disciplines, we seek to formulate a framework for developing and assessing equitable and inclusive educational technology.

**Keywords:** Equity and Inclusion in AIED · Educational Technology · Cognitive Abilities and Disabilities · Demographic Factors

## 1 Relevance and Importance to the AIED Community

Modern technologies have transformed teaching and learning by increasing access to information, enabling virtual or remote learning, and diversifying learning activities through multimedia channels [2]. However, technological advancements may not be uniform across learner populations. For instance, students from low-income or rural areas may not have the technology access required for digital learning; students with disabilities may struggle to use technologies that were not designed with accessibility in mind, and developers may not be critically evaluating AI fairness [8]. Advances in AI allow for a greater degree of personalization but may amplify existing inequities and negatively impact student learning [5].

Thus, to fully realize the potential of educational technology, it is crucial to ensure the commitment to *equity*, whereby all students are treated fairly with equal access to the resources necessary for their success, and *inclusion*, whereby the *diversity* of students in terms of race, social class, ethnicity, religion, gender, and ability are recognized and incorporated into the design of educational technology [1]. Recognizing this need, we propose a workshop that explores equity, diversity, and inclusion (EDI) in educational technology research and development, focusing on understanding the existing barriers and identifying solutions to overcome them.

This workshop will bring together researchers from different disciplines to collectively formulate a framework for developing and assessing equitable and inclusive educational technology that supports diverse populations. The workshop structure is based on the three stages of learning engineering – system design, experimental study, and data analysis – with each stage featuring brief presentations to build common ground, a guest speaker, and paper presentations. Throughout the workshop, participants will have the opportunity to learn from the field experience of researchers, practitioners, and developers, critically reflect on the inclusiveness of existing educational technology, and contribute to refining best practices in EDI. Participants will also engage in discussions about emerging topics in this area, including the bi-directional relationship between AI and EDI [10], the proper usage of demographics data in AIED research [6], and the influence of new generative AI technologies, such as ChatGPT<sup>1</sup> and GPT-4 [9], on EDI in education.

This workshop is expected to foster rich discussions and connections between junior and senior researchers across different disciplines. Through their participation, the audience will be able to (1) develop an understanding of where inequity or exclusion may manifest in educational technology, (2) share and learn from others’ experiences in promoting equity and inclusion, and (3) gather suggestions for making their own learning systems more inclusive. Upon completion of the workshop, we will invite participants to join a Discord space and mailing list dedicated to sharing advances in this area. Additionally, the synthesis of lessons learned in AIED-based equity and inclusion research will be summarized by the workshop organizers and shared with the broader community through the publicly available workshop proceedings. In a broader sense, we view this workshop as a follow-up to previous conversations on ethics in AIED [3, 4] and an opportunity to connect participants for future collaborations, such as on a literature review paper in this area of research.

## 2 Call for Papers

We will solicit papers from the AIED community about equity, diversity, and inclusion in educational learning tools research and development for K-12 and

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<sup>1</sup> <https://openai.com/blog/chatgpt>.

higher education. Educational technology is a broad term encompassing intelligent tutoring systems, educational games, learning systems and tools, and other technology that help people in education [7].

Authors of accepted papers will be invited to give a paper presentation of 10–20 minutes (depending on the number of papers selected). We will also publish accepted papers in the workshop proceedings.

## 2.1 Paper Topics

Paper topics include, but are not limited to, the following topics:

- Designing educational technology for underrepresented demographic populations (e.g., females in STEM, students with disabilities, racial minorities).
- Developing AI algorithms that adapt to gender, cognitive and physical ability, learning preferences, socio-economic status, etc.
- Improving and evaluating the accessibility of educational technology.
- Analyzing data from educational technology with demographic elements.
- Developing inclusive learner models considering demographics.
- Exploring the bi-directional relationship between AI and EDI.
- Reflecting on the proper usage of demographics data in AIED research.
- Discussing the influence of emerging large language models, such as ChatGPT and Bard, on EDI in education.

## 2.2 Submission and Review Process

Papers may be extended abstracts (2–4 pages, not including references) or short papers (4–6 pages, not including references). The event and the call-for-papers will be advertised through mailing lists, research communities, and personal connections. Information on the workshop and the call for papers is also available on a website created by the workshop organizers: <https://adelesmolansky.com/aied23-edi-edtech/>.

The review process will be single-blind (reviewers are anonymous, and authors are not), in which papers are assigned a score of -1, 0, or 1 based on the following criteria: relevance to the workshop, importance to the AIED community, and paper quality. Workshop organizers will tabulate scores and select the top 4–6 papers. Authors will be notified of the reviews and decision via email.

## 2.3 Important Dates

The schedule for the call for paper and review is as follows:

- Call for papers opens: April 1, 2023
- Paper submission deadline: May 19, 2023
- Paper review period: May 20–June 7, 2023
- Final paper decisions: June 8–11, 2023
- Notification of acceptance: June 11, 2023
- Camera-ready deadline: June 30, 2023
- Workshop day: July 7, 2023

### 3 Workshop Format and Activities

We will organize a full-day workshop with presentations from organizers, guest speakers, paper presentations, and structured discussions. The workshop will be offered in person (Toyko, Japan) and online (Zoom).

#### 3.1 Workshop Activities

The workshop will begin with a presentation about different demographic factors and the importance of considering demographics in the research and development of digital learning tools. Subsequently, we will focus on best practices to promote equity, diversity, and inclusion in each stage of the learning engineering cycle. Paper presentations, guest speakers, and discussions will be organized around each stage of the learning engineering cycle: (1) system design, (2) experimental study, and (3) data analysis. The workshop will feature a keynote speech from Professor Ryan Baker (University of Pennsylvania), who has extensively studied all three steps of the learning engineering cycle. The workshop will conclude with a discussion about how researchers can implement equitable and inclusive practices in their work.

For system design (stage 1), we will present prior evidence of how students' interaction with digital learning platforms differs by demographic factors, discuss how children with physical, cognitive, and behavioral disabilities can be considered in the initial design process, and feature presentations from researchers who developed learning tools for children with disabilities. To evaluate the effectiveness of learning tools through experimental study (stage 2), we will introduce different types of experimental studies (e.g., lab studies, classroom studies, observational studies), the principles of a good experimental study, and examples of rigorous studies from prior works. Lastly, towards iteratively improving the learning tools and better understanding the student's learning process with data analysis (stage 3), we will present several analytical techniques, discuss the insights gained from these techniques, and hear from authors who have submitted papers on this topic. We will conclude with a discussion about future research directions to promote equity and inclusion with educational technology, taking into account recent advances in social studies, technological accessibility, and AI methodologies. Through the participation of community members from multiple disciplines, we seek to formulate a framework for developing and assessing equitable and inclusive educational technology.

#### 3.2 Workshop Schedule

The specific schedule for the workshop is as follows:

- **10:00–10:45:** Introductions from the workshop members; presentation from workshop organizers about background information on the workshop topic.
- **10:45–11:30:** Guest speaker from organizing committee member Ryan Baker.

- **11:30–12:30:** Paper presentations for all accepted papers on designing and evaluating new learning tools (*learning engineering cycle steps 1 and 2*).
- **12:30–13:30:** BREAK
- **13:30–14:15:** Paper presentations for all accepted papers on the design and evaluation of new learning tools (*learning engineering cycle step 3*).
- **14:15–14:30:** Introduce the final discussion.
- **14:30–15:30:** Small group discussions organized by learning engineering cycle steps.
- **15:30–16:00:** Full group discussion.

## 4 Organizers

- **Adele Smolansky** will be a first-year Ph.D. student at Stanford University starting Autumn 2023. She recently graduated from Cornell University with a BS in Computer Science. Adele’s research is on applications of AI to educational technology and creating accessible and inclusive learning tools for all students.
- **Huy Nguyen** is a fifth-year Ph.D. student in Human-Computer Interaction at Carnegie Mellon University. His research employs experimental studies and educational data mining to examine how digital learning games can bridge the gender gap in middle-school math education.
- **Rene Kizilcec** is an Assistant Professor of Information Science at Cornell University. He studies the impact of technology in formal and informal learning environments and scalable interventions to broaden participation and reduce achievement gaps. His recent work is on academic progress, algorithmic transparency, and fairness in predictive analytics in higher education.
- **Bruce M. McLaren** is an Associate Research Professor in the Human-Computer Interaction Institute at Carnegie Mellon University and was the President of AIED from 2017 to 2019. His research focuses on digital learning games, intelligent tutoring systems, and collaborative learning. He has around 200 publications, spanning journals, conferences, and book chapters.

## 5 Program Committee

The program committee will include researchers from various research areas such as accessibility, educational technology, AI fairness, cultural studies, games, gender, racial equity, diversity, and educational neuroscience. Members include Professors Jessica Hammer (Carnegie Mellon University), Richard Ladner (University of Washington), Shima Salehi (Stanford University), Nick Haber (Stanford University), Ryan Baker (University of Pennsylvania), Ivon Arroyo (University of Massachusetts Amherst), and Rod Roscoe (Arizona State University); research scientists Hao-Fei Cheng (Amazon) and Benjamin Shapiro (Apple); and Ph.D. students Na Li (Penn State) and Kimberly Williamson (Cornell University).

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