CADRE Learning Series

Ethical Use of AI in STEM Education Research

May 15, 2024 | 2-3:30 PM ET

Learn more at go.edc.org/learning-series-AI

Ilana Horn
Vanderbilt University (Moderator)

Tiffany Barnes
North Carolina State University

Joshua Danish
Indiana University

Samantha Finkelstein
Carnegie Mellon University

Ole Molvig
Vanderbilt University
Agenda

- Introductions
- Presentations by Panelists (Barnes, Danish, Finkelstein, Molvig)
- Discussant comments (Horn)
- Q & A with audience
Panelist - Tiffany Barnes
North Carolina State University
NSF AI Institute for Engaged Learning

AI-Driven Narrative-Centered Learning Environments

- Narrative-Centered Learning
- Embodied Conversational Agents
- Multimodal Learning Analytics

Ethics: Trust & Privacy

Core AI Methods

- Natural Language Processing
- Computer Vision
- Machine Learning

Ethics: Fairness, Accountability, & Transparency

Requirements & Feedback

Technology Elements

Use-Inspired AI Research

Educational Impact In and Out of School

Ethics: Diversity, Equity, & Inclusion

STEM Learning Contexts

Informal

Formal

NSF AI Institute for Engaged Learning
STARS Computing Corps

Developing leaders in broadening participation research & practice

Annual events & programs
RESPECT research conference
STARS Celebration conference
Faculty & student webinars
STARS student chapters
STARS AI Scholars co-sponsors:

- 53 academic institutions
- 2600 college student BPC leaders
- 80 faculty BPC leaders
- >3800 student-led BPC events
- >100 peer-reviewed publications
- >30 research proposals developed

GPAs, Graduation rates
Identity, belonging, interest
Technical, professional, leadership skills
Projects

AI & Data-driven Learning Environments and Analytics, especially for problem solving help and progress support

Programming Games & Supports
Framing Common AI Ethics Principles

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<th>Justice</th>
<th>Respect</th>
<th>Beneficence</th>
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<td>Responsibility to distribute burdens &amp; benefits equitably</td>
<td>Responsibility to protect human rights &amp; dignity</td>
<td>Responsibility to benefit people &amp; minimize harm</td>
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<td>Accountability</td>
<td>Transparency</td>
<td>Non-maleficence (do no harm)</td>
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<td>Fairness</td>
<td>Explainability</td>
<td>Pedagogical Appropriateness</td>
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<td>- AI Literacy</td>
<td>- Classrooms</td>
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<td>- Human Dignity</td>
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<td>- Social Relationships</td>
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<td>Economic class</td>
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<td>Social class</td>
<td>Identity</td>
<td>Society</td>
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<td>Role</td>
<td>Environment</td>
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<td>Who &amp; Where are people and places with benefits?</td>
<td>How are people prioritized &amp; how are data and decisions handled?</td>
<td>Why will the work improve STEM education?</td>
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Commonly cited AI Ethics Principles in bold

Panelist - Joshua Danish

Indiana University
A specific form of “intelligence” will help lead to measurable benefits for some participants.

● AI Needed qs
● AI Environmental cost qs
● AI equitable access and justice qs

Overarching project design

Embodiments that leverage AI in the design

- Interface for learners
  - AI sensing & privacy qs
  - AI training and bias qs
  - AI text or art qs
  - AI labeling / decision qs

Anticipated processes in the learning context

- Interactions between learners and each other or the software
  - AI sensing & privacy qs
  - Real-time usage qs

- Interactions between teachers and software
  - AI sensing & privacy qs
  - Real-time usage qs

- Other interactions observed by AI tools (e.g., video recordings)
  - AI sensing & privacy qs
  - AI data / model sharing qs
  - Real-time usage qs

Measurable outcomes

- Benefits for learners
  - AI literacy
  - Personalized support
  - Content learning
  - AI labeling / decision qs

- Benefits for teachers
  - AI literacy
  - Support for differentiation
  - Support for orchestration
  - Assessment & decision-making guidance

- Benefits for researchers
  - New forms of understanding about learning
  - New models or data
  - AI privacy, bias, and data sharing qs (all of them!)

Other consequences for participants, their community, the environment, creators, etc.
Panelist - Samantha Finkelstein

Carnegie Mellon University
“The Purpose of a System is What It Does”

• Maps | Classrooms | AI applications

Design represents and reveals ideologies

The ceiling of how ethical an AI application can be is set by the structure in which that application will be deployed

Talking meaningfully about educational equity requires talking honestly about which existing status quos we are and are not currently addressing

The real ‘best practice’ is be very honest about your premises and outcomes.

• What data do I have? What interpretive leaps am I making about people from that data?
• What am I doing to people based on my interpretation of that data?

Adrift in a world in which everything and anything is possible, thinking is the only activity standing between ourselves and the most heinous of evils.

- Hannah Arendt
Panelist - Ole Molvig

Vanderbilt University
Prototype for a model card for education, leveraging ethics, technical, and pedagogical expertise, to be included in 2 upcoming publications.
Discussant Comments
Appreciations

- The Belmont Report is a widespread and familiar ethical framework for researchers
- The brief offers **concrete tools** to investigators and users of AIED
- The authors aim to **center justice** in their framing of the ethical issues
Questions

“Jim Crow practices feed the ‘New Jim Code’ – automated systems that hide, speed, and deepen racial discrimination behind a veneer of technical neutrality.”

– Ruha Benjamin
Lessons from Biomedical Ethicists

“While the Belmont Report was an impressive response to the ethical issues of its day, the field of research ethics involving human subjects may have outgrown it.”


Belmont report places too much emphasis on individual choice, does not consider potential harms to nonparticipants, and does not account for new modes of research with human subjects.

Example from Biomedical Ethics: BMI Index

1830
Belgian Mathematician Quetelet created Body Mass Index to describe populations

1880s
Eugenics movement and biological determinism

20th-21st Century
Numerous social consequences linked to BMI: insurance premiums, medical stigma, denial of care

2005
JAMA article shows higher death rates associated with low BMI, not high BMI
Please use the Q & A function in Zoom to post your questions
CADRE Resources for You | cadre@edc.org

1. CADREK12.org | Access NSF Proposal Toolkit, solicitation webinar recordings, project descriptions and products

2. CADRE Newsletter | Subscribe to keep up-to-date with DRK-12-related news and events

3. @CADREK12 | Stay engaged with the DRK-12 community
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