Making Art with and about Artificial Intelligence

Three Approaches to Teaching AI and AI Ethics to Middle and High School Students

Ben Walsh
University of Colorado Boulder
benjamin.walsh@colorado.edu

Kayla DesPortes
New York University
kayla.desportes@nyu.edu

Irene Lee
MIT STEP Lab
ialee@mit.edu

Safinah Ali
MIT Media Lab
safinah@medialab.mit.edu

Daniella DiPaola
MIT Media Lab
dipaola@mit.edu

Scott Sieke
CU Science Discovery
scott.sieke@colorado.edu

Francisco Castro
New York University
francis.evgc@gmail.com

William C. Payne
New York University
william.payne@nyu.edu

Helen Zhang
Boston College
zhangzm@bc.edu

ABSTRACT

Significant strides have been made in developing guidelines and standards for K-12 Artificial Intelligence education, yet it is of vital importance that educators consider not only what students need to know, but also how to make their subject compelling to a broad range of learners. In this hands-on workshop participants will have the opportunity to experience the curricula from three NSF funded research projects which address this challenge: danceON, DAILy and Imagine AI.

danceON is a web-based creative coding environment that engages learners in creating multimedia dance performances. In addition to writing reactive code that generates animations to augment dance performances, students also use the system to explore the boundaries and biases of AI.

DAILy is a middle school curriculum focused on developing AI literacy among middle school students through the integration of technical concepts and processes, ethical and societal implications, and career futures in AI. Participants in the workshop will be focusing on the AI + art modules of DAILy.

Imagine AI develops project-based curricula to support youth in exploring critical ethical issues related to AI. Students read short stories featuring youth at the center of AI ethical dilemmas, build and manipulate AI systems, and create digital media to express ethical stances.

Each of these projects asks students to create art with and about AI technologies, while exploring related ethical concerns. As such, participants will leave the workshop with multiple strategies for using AI teaching tools in a way that blends technical learning with social purpose and creative expression.

MODE

This workshop is designed to be run onsite, however, each of the three teams involved have experience implementing their curriculum in remote settings. Presenters have the experience necessary to adapt to a hybrid or remote context if need be. For a hybrid implementation each team will have a member dedicated to interacting with attendees who are not onsite.

1 Significance and Relevance of the Topic

As AI technologies become increasingly ubiquitous and influential in our society [8] it is essential that we support youth in becoming ethical creators, consumers and critics of AI systems. Recent work has deepened our understanding of what K-12 students need to know about AI [11]. An important next step for educators is to better understand how to teach AI and AI ethics in ways that are broadly appealing to students, especially members of minoritized groups that have been excluded from Computer Science and related fields.

While recruiting diverse voices to the field is an ongoing challenge for all computer science educators [6], it is particularly urgent in the field of AI, which has been too slow to react to forms of algorithmic bias which disproportionately affect members of minoritized communities [3]. Ensuring that AI becomes predominantly a force for good will require future leaders whose voices represent the broad set of experiences and cultures that make up our society. In order to address this challenge the three projects contributing to this workshop build on a tradition of incorporating art [10] creative self-expression [12] and social purpose [2] into CS instruction in a manner intended to invite members of excluded communities into the field.

Each of the three projects include (but take different approaches to implementing) the following elements:

-The opportunity for students to create with AI tools in order to develop both intuitive and technical understandings of how they work.

-The opportunity to explore ethical dilemmas related to those AI systems as well as the effects they have on students and their communities.

-The opportunity to create art with and about AI.

While in breakout groups attendees will experience key moments in the curriculum related to the above elements, and also receive an introduction to the larger scope of each project, including free tools and resources used.

Individual Breakout Session Details

danceON [9]: Attendees will explore the danceON interface and domain specific language as they create animations that respond to position data of the pose detection algorithm. Working in teams, participants will: (1) explore the seams of the pose detection algorithm to create poses and movement sequences that "break" or "trick" the algorithm, and (2) train a simple model creating classifiers with Google's Teachable Machine that they upload to trigger animations. Presenters and attendees will then discuss how to more deeply explore biases and breakdowns of machine learning models with middle and high school students who have gone through similar activities.

DAILy [1, 5, 7]: Attendees will be introduced to generative AI through some applications and examples generative media. They will learn about how Generative Adversarial Networks (GANs) are developed, and how they can generate art. We will be exploring 4 tools that the audience can use to generate text, drawing, music and videos. Participants will be brainstorming positive and negative uses of each of these interactive tools. We will be discussing the generation of manipulated human audio and face media, or Deepfakes and the ethical and societal implications of doing so. We will discuss strategies for detecting Deepfakes. Finally, we will be discussing policy decisions about generative media on social media tools.

Imagine AI [4, 13]: Attendees will read and discuss the short story, "How to See," which highlights the experiences of a family affected by biased algorithms used in the criminal justice system. They will compare the experience of reading this fictional piece to the experience of reading non-fiction texts on similar instances of algorithmic bias. Next, they will work with Google's Teachable Machine to experience the outcome of a biased data set, then work to improve that data set. The session will conclude with attendees creating and sharing digital comics about instances of algorithmic bias.

2 Expertise of Presenters

danceON

Kayla DesPortes is an Assistant Professor of HCI and the Learning Sciences at NYU Steinhardt. She has expertise in designing, implementing, and researching culturally sustaining, creative computing curriculum and technology for Middle and High School youth.

Willie Payne is the lead developer on danceON. He is a PhD Candidate in Music Technology at NYU, a composer by training, and the Music Technology Fellow at the FMDG Community Music School for the Blind.

Francisco Castro is a Computing Innovation Fellow at NYU on AI, AI ethics, and education. His research in computing education focuses on the equitable design of curricula and technologies for learners to engage with computing, and on the interactions between games and learning computing.

DAILy

Safinah Ali is a Phd student at MIT Media Lab and has experience in generative AI and human-AI co-creation. She has previously developed and taught middle school AI curricula.

Daniella DiPaola is an MS student at MIT Media Lab and has experience in human-robot interaction and AI ethics. She has previously developed and taught middle school AI curricula.

Irene Lee is a research scientist at MIT's Scheller Teacher Education Program (STEP Lab). She has extensive experience developing STEM, CS, and AI curricula, and partners with districts nationally to bring these resources to classrooms.

Helen Zhang is a learning scientist at Boston College. She has extensive experience developing and researching technology-enhanced learning environments to engage students from underrepresented groups in STEM/CS education.

Imagine AI

Ben Walsh is the director of the Imagine AI Project at CU Boulder. His expertise lies in developing, implementing and studying technology rich interdisciplinary project-based learning in multilingual classrooms.

Scott Sieke is an instructor, curriculum developer and researcher at CU Science Discovery. He is experienced in developing and implementing STEM learning experiences in formal and informal setting, as well as teacher professional development.

3 Agenda for the Workshop

Introductions (20 minutes): Each team takes 5-7 minutes to introduce their project and the hands-on experience they will offer.

Breakout session #1 (1 hour): Attendees choose one of the three projects and experience a key piece of its curriculum as if they were students, as well as an introduction to the larger project.

Reflection (10 minutes): We reconvene as a large group. Attendees share important things they noticed, or ideas that were sparked while experiencing the curricula.

Break (15 minutes)

Breakout session #2 (1 hour): Attendees choose another of the three projects and experience a key piece of its curriculum as if they were students, as well as an introduction to the larger project.

Discussion/Q&A (15 minutes): We come back together as a full group once more for discussion and Q&A.

4 Expected Audience

The primary target audience of this workshop is middle and high school educators, as well as researchers interested in K-12 AI education.

5   Participant Equipment Requirements

Attendees must bring a laptop or chromebook to the workshop. A webcam and microphone are recommended, but not required.

6   Advertisement

This hands-on workshop invites you to experience key moments in Artificial Intelligence curricula designed for middle and high school students. danceON, DAILy and Imagine AI are NSF funded projects that combine technical AI content knowledge with ethics instruction and the opportunity to create art with and about AI. During this session attendees will receive an in-depth introduction to two of the three projects (of their choice), including the free tools and resources associated with each, and discuss approaches for making AI and AI ethics interesting and relevant for diverse groups of learners.

This workshop is intended for middle and high school educators interested in AI, as well as researchers interested in this context. All attendees should bring a laptop or Chromebook. A webcam and microphone are recommended but not required.

7   Enrollment Limit

Enrollment is limited to 40 participants.

8   Scheduling Constraints

We have no scheduling constraints.

9   Other Critical Information

NA.

ACKNOWLEDGMENTS

REFERENCES

[1] Safnah Ali, Daniella DiPaola, Irene Lee, Jenna Hong, and Cynthia Breazeal. 2021. Exploring Generative Models with Middle School Students. In CHI Conference on Human Factors in Computing Systems (CHI '21), May 8–13, 2021, Yokohama, Japan. ACM, New York, NY, USA, 13 pages. https://doi.org/10.1145/3411764.3445226

[2] Paulo Blikstein. 2008. Travels in Troy with Freire: technology as an agent for emancipation. In P. Noguera & C. A. Torres (Eds.), Social Justice Education for Teachers: Paulo Freire and the possible dream (pp. 205-244). Rotterdam, Netherlands: Sense.

[3] Joy Buolamwini, Timnit Gebru. 2018. Proceedings of the 1st Conference on Fairness, Accountability and Transparency, PMLR 81:77-91, 2018.

[4] Bridget Dalton, Ellie Haberl, Tom Yeh, Stacey Forsyth and Benjamin Walsh. 2020. Using stories with embedded Artificial Intelligence ethics dilemmas to develop youth's critical awareness and design skills. Literacy Researchers Association Annual Meeting, 2020.

[5] Daniella DiPaola, Safinah Ali, J. Hong, Helen Zhang, Cynthia Breazeal and Irene Lee. 2021. Youth as Investigators of Bias in Artificial Intelligence. American Educational Research Association

[6] Richard Fry, Brian Kennedy and Cary Funk. 2021. STEM Jobs See Uneven Progress in Increasing Gender, Racial and Ethnic Diversity. Pew Research Center.

[7] Irene Lee, Safinah Ali, Helen Zhang, Daniella DiPaola, and Cynthia Breazeal. 2021. Developing Middle School Students' AI Literacy. In Proceedings of the 52nd ACM Technical Symposium on Computer Science Education (SIGCSE '21), March 13–20, 2021, Virtual Event, USA. ACM, New York, NY, USA, 7 pages. https://doi.org/10.1145/3408877.3432513

[8] Cathy O'Neil. Weapons of math destruction: How big data increases inequality and threatens democracy. Broadway Books, 2017.

[9] William C. Payne, Yoav Bergner, Mary Etta West, Carlie Charp, R. Benjamin Shapiro, Danielle Albers Szafr, Edd V. Taylor, and Kayla DesPortes. 2021. danceON: Culturally Responsive Creative Computing. In CHI Conference on Human Factors in Computing Systems (CHI '21), May 8–13, 2021, Yokohama, Japan. ACM, New York, NY, USA, 16 pages. https://doi.org/10.1145/3411764. 3445149

[10] Kristin A Searle and Yasmin B Kafai. 2015. Culturally responsive making with American Indian girls: Bridging the identity gap in crafting and computing with electronic textiles. In Proceedings of the Third Conference on GenderIT. 9–16.

[11] David Touretzky, Christina Gardner-McCune, Fred Martin, and Deborah Seehorn. 2019. Envisioning AI for K-12: What should every child know about AI?. In Proceedings of the AAAI Conference on Artifcial Intelligence, Vol. 33. 9795–9799

[12] Aditi Wagh, Brian Gravel, Eli Tucker-Raymond, and Susan Klimczack. 2016. Negotiating tensions between aesthetics, meaning and technics as opportunities for disciplinary engagement. In Proceedings of the 6th Annual Conference on Creativity and Fabrication in Education (FabLearn '16). Association for Computing Machinery, New York, NY, USA, 58–65. https://doi.org/10.1145/3003397.3003405

[13] Benjamin Walsh and Bridget Dalton (2021), Exploring A.I. Ethics with Stories, Comics, and Chatbots in an Online Summer Camp. American Educational Research Association Annual Meeting, 2021.