



EAAI-23 Blue Sky Ideas in Artificial Intelligence Education from the AAAI/ACM SIGAI New and Future AI Educator Program

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The 13th Symposium on Educational Advances in Artificial Intelligence (EAAI-23), co-chaired by Michael Guerzhoy, Marion Neumann, and Pat Virtue, continued the tradition of the AAAI/ACM SIGAI New and Future AI Educator (NFAIED) Program to support the training of early-career university faculty, secondary school faculty, and future educators (PhD candidates or postdocs who intend a career in academia).

This paper is a collection of the “blue sky” essays of the 2023 NFAIED awardees, intended to help motivate discussion around various current and important issues in AI education.

Making AI Education More Interdisciplinary Through Computational Creativity

Carolyn Jane Anderson (Computer Science, Wellesley College)

Artificial Intelligence is an attractive subfield to students because it encompasses technologies that have the potential for great impact on society. Some computer science students find this exciting, while others find it threatening. As an educator, I find this binary division between fear and hope difficult to navigate, as I mediate between the Optimists, who write in their reflections (and course evaluations) that there is too much focus on the negative side of technology, and the Pessimists, who are quick to allocate blame, but struggle to propose alternatives. What links Optimists

and Pessimists is the shared belief that the power to shape the future lies with technologists: they disagree only about whether non-technologists are victims or beneficiaries. My goal is to push students outside of these familiar camps into a broader view of AI by focusing on computational creativity.

Computational creativity is an approach to technology that emphasizes curiosity and playfulness. It brings together individuals with a range of skills and backgrounds around a shared interest in using technology for humanistic pursuits. By focusing on computational creativity, I hope to replace the technological savior/menace narrative with one that highlights the agency of non-technologists. From David Cope's early experiments in AI-generated music, to language model-generated recipes and jokes, and now in the growing art generation community, humanists have played a role in shaping, designing, and adapting technology to pursue their own goals throughout the history of AI.

In my course, I try to emphasize these creative applications of AI in a number of ways. Each of my programming assignments produce something of interest to non-technologists: a sudoku solver, a recipe classifier, a chatbot that plans menus, recommends gifts, or picks out poems. I assign Janelle Shane's *You Look Like A Thing And I Love You*, which emphasizes the weirdness of neural networks. Students love this book; they frequently mention how accessible and fun it is. Most importantly, I have been working to bring students and faculty from other departments into the conversa-

tions that we have in my class. This semester I partnered with a colleague in Cinema and Media Studies for a unit on AI art generation. My students generated illustrations for a short story and the Cinema and Media Studies students served as art competition judges. We held a joint class with an awards ceremony and a discussion about the ethics of art generation.

My vision is to create an AI curriculum centered around co-teaching and collaboration between departments. I believe that everyone has the potential to shape how technology is used in the future, and it is our obligation as AI educators to give students outside of computer science the chance to contribute. Hearing their voices on a more regular basis would benefit the computer science students by helping them to recognize that technologists do not have all the power: they can work hand-in-hand with humanists to dream up a better future.

Can we use some advances in AI to teach AI? How could we make AI education more interdisciplinary?

Yaman K Singla (IIIT-Delhi; State University of New York at Buffalo)

ChatGPT (an AI chatbot from OpenAI with exceptional chat capabilities) was released a few months ago, and the impacts have been staggering. It has since exploded in popularity (over one million users in its first week of launch), and its power is just beginning to be understood. The CEO of Chegg, an educational technology company with a market cap north of 1.3 bi USD, which helps students with their homework, reported ChatGPT being the cause for a 46% decline in its stock value [1]. Some academics call ChatGPT “the end of homework” [2,3]. The fear is that students will use it to cheat on exams and homework assignments. However, ChatGPT is just a new wine in an old bottle. Plagiarism and homework outsourcing are not new phenomena. The only difference now is that the tools are much more capable, cheaper (free), accessible, and proficient at avoiding plagiarism detection. However, instead of fearing new technology and calling for bans, this should be a call to change in the way we approach ed-

ucation through the lens of standardized curriculums and testing.

The historical roots of standardized curriculums in West can be traced back to the last 300 years when the industrial revolution led to an increase in the need for workers with specific skills and knowledge and, consequently, a dramatic increase in school enrolment [7,8,9]. As enrolments continued to rise, national standards for high school programs and college entrance requirements became necessary to help schools adequately prepare their students for college and to help colleges to evaluate the increasingly large pool of applicants from a wide range of high school programs [8,9,10]. In order to meet this need, schools began to implement standardized curriculums that focused on subjects like reading, writing, and arithmetic, with the goal of preparing students for the workforce. Standardized curriculums were seen as a way to ensure that all students received the same basic education and had the skills necessary to be successful in their chosen careers.

We are no longer constrained by similar constraints as present then. Further, standardized curriculums and testing have long been criticized for their lack of flexibility and for failing to consider students’ individual needs and abilities. They often focus on rote learning and memorization rather than fostering critical thinking and problem-solving skills. The results of this one-size-fits-all curriculum are uninterested students, test-motivated education, high student drop-out rate, low employability and low research outputs.

On the other hand, recent advances in Artificial Intelligence can help us move towards a more personalized approach to education. One such technique is curriculum learning [4]. Curriculum learning is a machine learning approach in which the learning algorithm automatically selects the most effective learning steps or curricula for a given task. This is different from traditional machine learning approaches, where the training data and learning algorithm are fixed and do not change over the course of learning [5,6]. In curriculum learning, the algorithm adapts to the data and selects the most effective way to present the training examples to the model.

Similar to how a model is made to learn the

entire dataset in the most efficient manner, students can be taught the subjects that they want to learn in the most efficient manner in a personalized way. The idea is to divide the subject into small indivisible units which have associated skill mapping. By using curriculum learning, the algorithm can automatically select the most effective sequence of learning steps for each individual student, based on their previous knowledge and learning progress tested on modules. This could enable personalized education experiences that are tailored to each student's needs and abilities and that are able to adapt as the student's knowledge and skills evolve over time. By carefully planning the units in a subject (similar to how a researcher curates their dataset, dividing it into carefully planned sets) and regularly assessing the progress of students (on each skill), educators can provide a high-quality education that helps students develop the knowledge, skills, and abilities they need to succeed, helping move from a one-size-fits-all approach to personalized education and skill development.

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Using Critical Design Methods to Teach AI Ethics

Alexi Orchard (English Language and Literature, University of Waterloo)

In recent years, there has been growing interest in developing pedagogical tools, frameworks, and resources for teaching the ethics of artificial intelligence (AI). One 2021 syllabi review compiled 254 AI ethics courses at 132 North American universities [1]. In an AI ethics course, instructors may discuss ethical principles (e.g., professional codes), broader societal implications (e.g., impacts of facial recognition technology for marginalized populations), or consequences of future technology (e.g., artificial general intelligence) [2], [3]. There also exist sociotechnical frameworks that prompt students to consider topics including data bias, fairness, and accountability alongside their learning of technical outcomes [4], [5].

However, Raji et al. has observed that AI ethics pedagogy can be "exclusionary" in nature: it tends to prioritize technical expertise and not engage with perspectives from humanities and social science (HSS) disciplines [1]. In doing so, AI ethics is isolated from the critical contextualization of the communities in which it is designed and deployed. To combat this epistemological and disciplinary divide, Raji et al., among many other scholars, advocate for cross-disciplinary AI ethics pedagogy. Demonstrating the potential of this approach, computing ethics educators have reported successful interventions when drawing on HSS expertise in their curricula [6], [7].

Enter *critical design*: an arts-based research practice that has been described as a mode of "problem finding" rather than "problem solving" [8]. Anthony Dunne and Fiona Raby, the design team who created the term, were inspired by and concerned with "the uncritical drive behind technological progress, when technology is always assumed to be good and capable of solving any problem" [9].

Designer and theorist Matt Malpass explains how critical design “challenges hegemonies and dominant ideologies in contexts of science and technology, social inequality, and unchallenged disciplinary norms” [8]. Some common modes of critical design include speculative fiction, alternative histories, and objects-to-think-with. A mainstream media example that uses speculative fiction is the TV show *Black Mirror*. Microsoft Research’s *Judgement Call* is another notable example of a design fiction game to help industry product teams explore ethical concerns [10].

When teaching undergraduate engineers and conducting research in the Critical Media Lab at the University of Waterloo, I often employ *The Tarot Cards of Tech* by The Artefact Group [11] – a deck of cards that help designers envision opportunities and consequences of their work. For instance, some card prompts include:

- How might a community change if 80% of residents used your product?;
- If the environment was your client, how would your product change?
- If your product was entirely dedicated to empowering the lives of an under-served population, what kind of impact could you make?

The *Tarot Cards of Tech* are one of multiple critical design tools that provide compelling and accessible starting points for cross-disciplinary collaboration. Critical design in its many forms has much to offer in the way of generating conversations about the purpose, design, and implementation of AI technology. I imagine that AI education would benefit not only from utilizing critical design in the classroom but also from welcoming more diverse disciplinary perspectives broadly.

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How could we teach AI topics at an early undergraduate or a secondary school level?

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Literacy in any subject can be crystallized in three verticals: gathering knowledge, applying that knowledge (building skill), and attitude shift [1]. Similarly, the three verticals for Artificial Intelligence (AI) literacy can be seen as:

- **Gathering knowledge:** Studying and understanding the concepts, algorithms, and techniques used in AI.
- **Building skill:** Applying the knowledge and concepts learned to develop and implement AI-based solutions, such as building and training machine learning models, developing natural language processing systems, and creating intelligent agents.
- **Attitude shift:** Recognizing the potential and limitations of AI, and understanding how it can be used ethically and responsibly to benefit society.

However, this conventional path of first gathering knowledge, then applying it, and bringing about attitude shift implies a linear progression which is often not possible due to the extremely difficult nature of translating learnt knowledge to real-world problems. On the other hand, the ability to apply learnt knowledge to real-world problems is one of the reasons why computer science courses like “Introduction to Programming” have been extremely popular over the years.

Given this success of applied courses, the question that we need to answer is how to replicate this with AI? The AI community has recently been heavily focusing on production. Advancements in large language models like GPT-3, ChatGPT, BLIP, DALL-E are some artefacts that demonstrate the potential of AI to solve complex problems while being accessible to the masses. This recent shift presents completely novel and exciting opportunities for AI education. Lately, I have personally seen school students using DALL-E for image generation and talking to ChatGPT, seeing their responses and hidden biases, and wondering why the models gave those answers. This is exactly what the AI education community wanted to foster through any AI curriculum. I teach an “Introduction to HCI” class having 620 students where I actively ask students to use these models for their projects.

These recent innovations have helped to invert the conventional pyramid (knowledge → skill → application and attitude) followed in any other branch of education. Here, users first try hands-on use-cases, discover flaws, search for answers, solve them, and iterate. Given this new way of learning, as the AI education community, we just need to provide them resources to nudge them in the right direction. This AI- curriculum should focus on providing students with the resources and guidance they need to explore and experiment with these tools, and to develop a deep understanding of the AI tools, concepts and techniques. In my Information Retrieval course, I have adopted this methodology to ingrain IR concepts to a batch of 210 students.

One approach of doing this might be to create a series of learning modules or units that students can work through at their own pace. Each module could focus on a different AI concept or technique and could include a combination of lectures, demonstrations, hands-on activities, and discussions. This will not just build the AI skills in students but also give them vocational training since now they would be able to understand each of these concepts and how do creative artists who use Photoshop and similar tools achieve this. Further, for any shortcoming, they can be taught on how they can fine-tune the large and small pre-trained models to achieve their desired goals ultimately helping us build vocational, computational, and societal understanding of AI concepts and in the process reducing the euphoria which surrounds AI and it taking over everything.

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introducing students to data science in a practical and hands-on way.

Pat Virtue is an Assistant Teaching Professor in the Computer Science and Machine Learning departments at CMU. As teaching faculty, he focuses on courses, curriculum, and improving educational methods. His educational mission is centered around demystifying AI and



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