

Asking the Right Questions: The meaning of teaching and learning in the age of generative AI

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Abstract

As educators grapple with the impact of generative artificial intelligence (AI) and the ease of access to these models by learners, questions of pedagogy and learning have dominated the conversation. This paper explores the concerns of teaching through exploring the contrast between human and machine learning and the implications of both on educators facing an environment where AI is prevalent. Through a prompting process, a position paper was generated by ChatGPT3.5 on these contrasts and implications. The AI output, largely accurate, highlighted strategies for educators while also showcasing the limitations of the tool. Educators and scholars can support themselves and their students through critical reflection of the use of AI tools.

1. Introduction

My relationship to Artificial Intelligence is one of fascination and immediate curiosity. As an educator working in K-12 environments in the United States, my role is to support teachers as they navigate demands on their pedagogy in the face of technology integration, project based learning, universal design, and instructional design. As AI has entered the conversation, educators are faced with the task of sensemaking what it means for both themselves and the teaching methods they employ. Mishra, Warr, & Islam (2023), noted “Educators have been receiving mixed messages, and, not surprisingly, there is a great deal of uncertainty about what these technologies mean for teacher practice, teacher education, and student learning (1).” AI joins the litany of increasing pressures on teachers to improve teaching methodologies in the face of increasing rates of anxiety, decreasing rates of executive function, and a sense of urgency that educational paradigms need to shift towards authentic and real-world problem, pedagogies that have been shown to support human learning.

As a scholar, prior to this exercise have only used it to write my own biography—which was surprisingly accurate and of higher quality than the ones I have crafted over the course of my career—and I have not used AI at all in my scholarship. Instead, I have turned to the models for other tasks—synthesising YouTube videos to support universal design, crafting poetry experiments, testing what the models can do based on prompts from classrooms.

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My relationship to this topic is one of clear-eyed practicality—I am in conversation with teachers attempting to help them grapple with the fear and anxiety that the existence of these models evokes in them. Concerns about how the models work, the spectre of plagiarism, and the ethical considerations are complicated and nuanced issues that saturate the landscape of modern teaching.

In the *People's Guide to Tech: Artificial Intelligence* (2018), Mother Cyborg and Mimi Onuoha explored these issues in the context of equity, fairness, and justice. Their metaphor for AI seems particularly apt in our current educational context. “AI seems magical in how it can easily transform difficult tasks. But right now, AI is designed and implemented by large companies and governments. It is more like a bulldozer than a hammer. What we mean by this is that it’s a tool, but not a common one that everyone can use, like a hammer. Like a bulldozer, it is something that you need special training to work with and lots of money and resources to use on a meaningful level (p. 26)”

As I spend time in conversation with educators in post-secondary, secondary, and even in elementary schools, the question that keeps arriving is focused the ways in which we learn—the true humanity of it. The impact of digital technologies on motivation and persistence has been a scholarly interest that I have questioned and researched my entire career as an educator. Inviting artificial intelligence to generate an answer was my next step.

This position paper was generated through OpenAI’s ChatGPT-3.5. The prompt was given step-by-step, inviting the model to revise and add at every step. The prompts are as follows:

1. Write a position paper in APA format that cites research from the fields of education and psychology about the similarities and differences between artificial intelligence and human learning.
2. Revise the response above by adding a detailed discussion using citations from the fields of psychology and education to describe the research on evidence teachers can use to infer that a student is learning. Give detailed descriptions and suggestions for assessment with citations.
3. Revise the response above by adding a detailed philosophical discussion with citations from the fields of philosophy, education, and psychology about the reasons humans should continue to write, create, and learn when artificial intelligence is showing such strong abilities to mimic human intelligence. Include citations.
4. I then combined the outputs from each of the above prompts to create the full position paper, including in areas where ChatGPT indicated “Other references from the previous versions are retained.” The results are as follows:

2. AI Generated Position Paper

Comparing Artificial Intelligence and Human Learning: Insights from Education and Psychology

Author: ChatGPT

Institution: OpenAI

This paper explores the relationship between artificial intelligence (AI) and human learning, drawing insights from education, psychology, and philosophy. While both AI and humans exhibit adaptability and experience-based improvement, they differ in their underlying mechanisms and depth of understanding. As AI becomes increasingly integrated into human life, understanding these differences and similarities illuminates the unique intricacies of human cognition and emphasises the enduring significance of human creative and intellectual pursuits (generated by ChatGPT-3.5).

The increasing integration of AI in education demands a clearer understanding of the differences between AI and human learning. This paper seeks to highlight those differences and underscore the methods educators employ to gauge human learning, offering a comprehensive view of assessment practices.

AI's increasing proficiency poses the question: Why should humans continue their intellectual pursuits? The answer lies not just in the outcome but in the very essence of the human experience and our quest for meaning.

2.1. Similarities between AI and Human Learning

2.1.1 Adaptability: Both humans and AI systems have the capacity to adapt and change based on new information. The neural plasticity of the human brain (Huttenlocher, 2002) can be likened to the iterative training processes of machine learning algorithms.

2.1.2 Experience-based improvement: Just as humans learn from experiences and practice (Ericsson, Krampe, & Tesch-Römer, 1993), AI systems improve their performance with more data.

2.1.3. Transfer of knowledge: Both humans and certain AI models can apply knowledge from one domain to another, although the mechanisms and efficacy differ (Lake, Ullman, Tenenbaum, & Gershman, 2017).

2.2. Differences between AI and Human Learning

2.2.1 Underlying mechanisms: While AI learns through mathematical algorithms and predefined models, human learning is a result of complex biological processes involving emotions, motivations, and socio-cultural influences (Vygotsky, 1978).

2.2.2. Motivation: Human learners are often driven by intrinsic motivations, emotions, and personal goals (Ryan & Deci, 2000). In contrast, AI lacks emotions or consciousness and learns based on its programming and objective functions.

2.2.3. Depth of understanding: While AI can process vast amounts of information quickly, humans possess a depth of understanding, intuition, and the ability to make sense of abstract concepts (Gardner, 1983).

2.2.4. Social and cultural learning: Humans learn within social and cultural contexts, often relying on interpersonal interactions (Bandura, 1977). AI, on the other hand, doesn't engage in social learning in the same sense, although some models can simulate certain aspects.

2.3 Implications for Education and Future Research

The clear differences between AI and human learning indicate that while AI can be a powerful tool for education, it cannot replace the nuanced, multifaceted experience of human learning. Future research should further investigate how AI can complement educational practices rather than attempting to mimic or replace human teachers.

2.4 Evidence of Student Learning: Indicators and Assessment Techniques

2.4.1. Formative Assessment: This ongoing process aids teachers in understanding students' comprehension and adjusting instruction accordingly. Techniques include quizzes, discussions, and reflective journals. Formative assessment is known for its feedback-driven approach, which positively impacts learning (Black & Wiliam, 1998).

2.4.2. Summative Assessment: Occurring at the end of instructional periods, these assessments evaluate learning against benchmarks. Examples include final exams, standardised tests, and end-of-unit projects (Harlen, 2007).

2.4.3 Self-assessment: Encouraging students to evaluate their own learning can foster metacognition and self-regulation (Andrade & Valtcheva, 2009). This can include self-rating scales or reflective essays.

2.4.4 Peer Assessment: Students review their peers' work, providing feedback and gaining alternative perspectives. This method has been shown to improve understanding and collaborative skills (Topping, 1998).

2.4.5 Portfolios: Collections of student work over time offer a holistic view of progress and can include essays, projects, and other artefacts (Paulson, Paulson, & Meyer, 1991).

2.4.6 Observations: Teachers watch students, noting behaviours, engagement, and skills, gaining insights beyond traditional testing (Marzano, 2012).

2.5 Implications for Education and AI Integration

By understanding the multifaceted ways teachers assess student learning, AI developers can design tools that better support these practices. AI could, for instance, assist in streamlining formative assessments or helping students with self-assessment through guided reflection prompts.

2.6 Philosophical Grounding for Human Endeavour in the Age of AI

2.6.1 The Value of the Human Experience: Heidegger (1962) postulated that our being is intertwined with our world, suggesting that understanding and creation arise from our lived experience. An AI, devoid of emotions or existential dilemmas, lacks this profound connection to life.

2.6.2 Pursuit of Authenticity: Sartre (1956) emphasised living authentically, which involves forging our own paths. Relying solely on AI to create or learn could diminish our authenticity and self-determined existence.

2.6.3 Innate Curiosity and the Desire to Understand: From a philosophical standpoint, the pursuit of knowledge is not merely instrumental but intrinsically valuable (Aristotle, 1984). This innate curiosity drives humans to learn and explore, irrespective of AI capabilities.

2.6.4 The Socio-cultural Fabric of Learning: Vygotsky (1978) argued that learning is a social act, deeply rooted in culture. The act of learning reinforces and reshapes societal values and narratives, a nuance AI might not fully grasp or replicate.

2.7 Educational and Psychological Imperatives

2.7.1 Constructivist Learning: Piaget (1952) suggested that learning is an active process where individuals construct knowledge based on their experiences. This personal journey of discovery is irreplaceable.

2.7.2 Emotional and Cognitive Growth: Writing, creating, and learning foster emotional intelligence and resilience (Salovey & Mayer, 1990). Engaging in these acts nurtures cognitive and emotional faculties beyond the mere accumulation of knowledge.

2.7.3 Personal Identity and Agency: Engaging in intellectual pursuits helps individuals define their identities, values, and roles in society (Erikson, 1968). These endeavours allow for personal agency and a sense of contribution to the world.

2.8 Conclusion

While there are surface similarities between AI and human learning, particularly in adaptability and experience-based improvement, a deeper examination reveals stark differences in mechanisms, motivations, and outcomes. Recognising these differences is crucial for leveraging AI's potential in educational settings and appreciating the intricate nature of human cognition.

AI and human learning exhibit surface similarities but fundamentally differ in many respects. A deeper appreciation of human learning, especially the evidence-based methods educators use to assess it, is crucial for meaningful AI integration in education.

Despite the prowess of AI, human endeavours in writing, creating, and learning remain indispensable. They reflect our quest for meaning, anchor our identities, and embody the rich tapestry of human experience.

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3. Critical Reflection

Reflecting on the process of generating on AI, I found that the resulting output was not what I envisioned, especially compared to human writing. Because I am a relative novice to prompt writing, I struggled to create a prompt that would generate the output I hoped for the paper.

In order to generate the position paper above, I rewrote the prompt multiple times. I used both Bard and ChatGPT—both the free (ChatGPT-3.5) and paid (ChatGPT-4) versions of the model. Additionally, I used GPT4All's Falcon model to generate responses to the prompt I wrote. Each of the responses, despite rewrites to the prompt based on my own limited and novice understanding of prompt engineering, hovered between 400 and 600 words. The discourse around AI and its impact on business and education has focused on prompt engineering, and despite having read and played in other contexts, my inability to coax the interfaces into writing 2000-3000 words as specified in the call was frustrating and fruitless. I spent time on discussion boards and articles trying to improve and expand the output. I tested whether a step-by-step revision process might work better, and in the end it did. The step-by-step revision process, much like coaxing essays out of my 9th grade students as a young teacher, was the process that resulted in the most robust output that most closely hewed to what I had hoped for in the output, and the best output was generated by ChatGPT-3.5.

It is impressive to tap out a question at the core of the educational endeavour and watch the words fill up the screen written by what seems to be an invisible hand. The content and ideas were there—I have no quibbles with the assertions made or even the references cited. Overall, the accuracy of both ideas and assertions were impressive. What is lacking is the expansion of those ideas, the connections between the evidence cited and the stance the output had named.

For this example, ChatGPT-3.5 was able to elucidate a number of cogent examples and pulled legitimate citations—literature that I have cited in various contexts myself. Nonetheless, the output was quite straightforward and tended towards brevity—statements were made and a citation arrived without the statement, evidence, warrant trifecta that rhetoricians hope for in their students' writing. As I worked through writing with my AI partner, I was struck by how familiar it felt to supporting a young writer—the lack of voice, the lack of explanation, the lack of description are all hallmarks of writers just learning their craft. Perhaps this is why I found myself offering revision suggestions instead of rewriting a more robust prompt to begin with—the back and forth with the AI was more familiar to writing with a human co-author. The other benefit to the revision suggestion prompting was that it was the only way to expand the number of words the AI wrote.

On a technical level, for the majority of the cited evidence and referenced publications, ChatGPT-3.5 was accurate after checking each and every one. When citations were wrong, they were in one case off by one year (the publication year was 2006 instead of 2007) or co-authors were omitted: for example, Cole in the Vygotsky citation, which itself has been cited 150218 times according to Google Scholar. ChatGPT-3.5 was able to in large part accurately reflect oft-cited research, down the page number, in APA format.

As the technology evolves, I am now curious about the impact AI will have on scholarship in educational technology. I could imagine a future where journal articles are generated with an AI writing partner, especially for the review of relevant literature for a study. Scholars and researchers could potentially save time asking Bard to generate a list of relevant research on a

topic, and using Google search, which is now integrated into the Bard interface, double-check that the references are accurate, thus saving time in database searches.

As these models increase their fluency and accuracy, I can see a future where even the voice and point of view becomes more and more human-like and scholarly. As I reflect as a writer of scholarly articles, I remember reading research articles and creating a list of sentences that I felt were exemplary as a way to improve my own writing in the scholarly genre. AI models are now doing this on a scale that humans could never emulate.

Nonetheless, I believe in the future of human scholarship. Developing codes of ethics around the use of these tools will be important, and scholars who use AI models to support their work need to be transparent with readers of their work. Support for open source AI and responsible design should be a priority for authors and scholars. Responsible use of technology to support teaching and learning has long been a part of educational technology scholarship. Adding a tool to the toolbox, especially with responsible and ethical use of that tool, has the possibility to improve all of our work, efficiency, and output. At this point in time, it is not ready to replace human scholarship. To paraphrase my AI co-author, there remains a human desire to understand, to gain expertise, and to collaboratively explore phenomenon that will always exist, because AI still cannot answer questions that have not yet been asked.

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