The BlueDot

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UNESCO MGIEP

AI for Learner Flourishing



The BlueDot
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THE BLUE DOT features articles showcasing UNESCO MGIEP's activities and areas of interest. The magazine's overarching theme is the relationship between education, peace, sustainable development and global citizenship. THE BLUE DOT's role is to engage with readers on these issues in a fun and interactive manner. The magazine is designed to address audiences across generations and walks of life, thereby taking the discourse on education for peace, sustainable development and global citizenship beyond academia, civil society organisations and governments, to the actual stakeholders.

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"Look again at that dot.
That's here. That's home. That's us.

On it, everyone you love,
everyone you know, everyone you ever heard of,
every human being who ever was,
lived out their lives.
The aggregate of our joy and suffering
thousands of confident religions,
ideologies, and economic doctrines,
every hunter and forager, every hero and coward,
every creator and destroyer of civilization,
every king and peasant, every young couple in love,
every mother and father, hopeful child,
inventor and explorer, every teacher of morals,
every corrupt politician, every superstar,
every supreme leader, every saint
and sinner in the history of our species lived thereon
a mote of dust suspended in a sunbeam."

CARL SAGAN
PALE BLUE DOT: A VISION OF THE HUMAN FUTURE IN SPACE

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Chief Editor's Message

OBIJIOFOR AGINAM, DIRECTOR, UNESCO MGIEP

Humanity is at a pivotal moment in the ever-evolving landscape of education, research, and learning. Generative Artificial Intelligence (AI) has emerged as a transformative technological innovation that will fundamentally reshape how we teach, learn, and conduct research. Guided by UNESCO's comprehensive framework for approaching this technological revolution with ethical foresight, this issue of the Blue Dot explores the multifaceted relationship between generative AI and human flourishing in educational contexts.

The emergence of generative AI paradoxically presents us with unprecedented opportunities and complex challenges and dilemmas. As educators, researchers, policymakers, and learners, we must navigate this evolving terrain thoughtfully, ensuring that technology serves all of humanity with positive outcomes. UNESCO's guidance provides a crucial compass for this journey, emphasizing a human-centered approach that prioritizes ethical considerations, equity, safety, and meaningful engagement.

What makes generative AI distinct from previous technological innovations in education is its capacity to not only process information but to create content that mimics human output across various domains—from writing and coding to art and music. This creative potential opens new horizons for personalized learning experiences, adaptive educational resources, and innovative research methodologies. Yet it simultaneously raises profound questions about authenticity, originality, intellectual property, and the fundamental nature of human learning and creativity.

The articles in this Issue explore these paradoxical opportunities and challenges. They examine how generative AI is being integrated into curriculum design, offering teachers new tools to develop engaging, responsive, and personalized learning experiences. They explore how AI can support diverse learning needs, potentially facilitating access to high-quality educational resources and reducing barriers for marginalized communities. They investigate the transformation of research practices, where AI simultaneously serves as the object of study, and collaborative partner in knowledge creation.



However, this Issue also confronts the ethical dilemmas associated with these innovative approaches to learning. Contributors address the concerns about privacy, data protection, algorithmic bias, and the digital divide—issues that UNESCO's *Recommendation on the Ethics of Artificial Intelligence* identifies as central to responsible AI governance. They consider how we might develop regulatory frameworks that safeguard human rights while fostering innovation, ensuring that generative AI enhances rather than diminishes educational equity.

The UNESCO guidance reminds us that technology is never neutral; it embodies values, priorities, and assumptions. As we embrace generative AI in education and research, we must consciously shape it according to our highest educational ideals—critical thinking, creativity, collaboration, compassion, and cultural understanding. We must ask not only what AI can do for education but what kind of education we want AI to support.

Looking toward the horizon, this Issue contemplates the long-term implications of generative AI for educational systems and research paradigms. Contributors reflect on how these technologies might transform not only what we learn but how we learn, and indeed, what it means to be knowledgeable in an age where information generation is increasingly automated. They consider how educational institutions might evolve, how pedagogical approaches might shift, and how we might redefine the relationship between human and machine intelligence in learning environments.

Throughout these explorations runs a common thread: a commitment to learner flourishing as the ultimate measure of technological value. This means viewing generative AI not as an end in itself but as a means to enhance human capability, agency, and well-being. It means designing AI systems that amplify rather than diminish human creativity, that support rather than supplant human judgment, and that connect rather than isolate learners from one another.

As we stand at this technological threshold, this Issue invites readers to engage with and reflect on the promise and ethical concerns of generative AI in education and research. It challenges us to move beyond uncritical enthusiasm and reflexive skepticism toward a nuanced understanding of how these technologies can be positively harnessed to advance and sustain human flourishing.

The future of AI in education is not predetermined; it will be shaped by the choices we make today—choices about design, implementation, and regulation. By grounding these choices in ethical principles and human-centred values, as UNESCO's guidance encourages, we can ensure that generative AI becomes a powerful ally in our quest for innovative and inclusive educational experiences that are effective, equitable, and deeply humane.

Foreword

Artificial Intelligence (AI) refers to the development and implementation of algorithms that emulate human cognitive functions within machines, particularly computer systems. In the field of education, AI has given rise to various support services, such as voice assistants and digital tools that facilitate grammar correction, sentence completion, essay composition, and tutoring. Consequently, AI has emerged as a crucial asset for educators, enabling the integration of digital tools to support personalized learning. These technologies assist in curating, selecting, and adapting instructional materials while providing individualized learning pathways for students. The incorporation of AI into curricula, pedagogy, assessment, and instructional delivery ensures that repetitive and predictive learning processes can be tailored to individual learners, allowing them to progress at their own pace with technological support.



Hiroaki Ogata, Ph.D
Professor, Kyoto University



The United Nations Educational, Scientific and Cultural Organization's Mahatma Gandhi Institute of Education for Peace and Sustainable Development (UNESCO MGIEP) seeks to leverage this transformative moment in education. With AI-powered personal tutors now technically feasible for every learner, the institution aims to revive the fundamental purpose of education systems—promoting learner flourishing.

The concept of learner flourishing is deeply rooted in Article 26 of the Universal Declaration of Human Rights, which asserts that "education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms." This vision of education emphasizes not only academic achievement but also the holistic development of individuals. Learner flourishing encompasses cognitive mastery, emotional intelligence, social competence, creativity, resilience, and a sense of purpose. An education system that fosters flourishing nurtures students in environments that empower them to reach their full potential across multiple dimensions of life.

Advancements in technology over the past two decades have significantly enhanced our understanding of cognitive processes and the ways in which learning influences behaviour. For the first time in history, there is an opportunity to train the human brain to develop competencies that promote both individual and social well-being, fostering mindsets that support peace—both among humans and the nature.

AI's role in fostering learner flourishing is already evident. Through personalization, learning analytics, and natural language processing (NLP), AI can adapt educational experiences to accommodate diverse learning styles and abilities, ensuring greater inclusivity. Furthermore, by automating administrative tasks, AI allows educators to dedicate more time to personalized instruction and the creation of enriching learning experiences. Thus, AI has the potential to revolutionize education by delivering tailored, engaging, and inclusive learning opportunities that promote learner flourishing.

However, while AI offers numerous benefits in enhancing the efficiency and effectiveness of education, it also presents significant challenges. The quality of AI-driven education is contingent on the quality of AI systems themselves, meaning that any limitations within AI technologies will have direct implications for education. A critical concern is the digital divide, which restricts access to AI-powered educational tools for a substantial portion of the global population. As the quality of education increasingly aligns with the quality of AI, addressing barriers to access becomes imperative in ensuring educational equity.



This discussion raises several pertinent questions:

- Can AI serve as the transformative force needed to address the evolving complexities of 21st-century education?
- Will AI exacerbate existing inequities in access to education, or will it disrupt monopolies and democratize quality education?
- What behavioural changes can be anticipated among learners as AI becomes more integrated into education, and how might these changes impact society?
- Will the automation of administrative tasks enable educators to focus on deeper learning experiences, or will it diminish their roles within education?

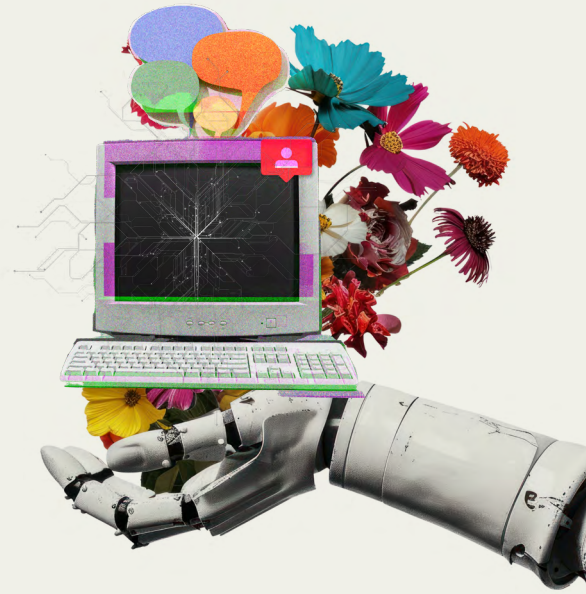


Beyond AI integration, learner flourishing necessitates a reconsideration of the skills and competencies required to prepare students for an increasingly complex and dynamic world. The International Science and Evidence-Based Education Assessment (2022) highlighted that real-world challenges today are unpredictable, complex, ill-defined, inequitable and focused only on humans. The planet, however, is biodiverse, of which humans are one species. Education needs to groom human learners to be compassionate, adaptable, creative, resilient, and peaceful for the planet to flourish. Thus, there is an urgent need for skills that train the whole human brain, including cognitive, academic, social and emotional (CASE) skills that will foster learner flourishing.



Introduction: AI and Education

Artificial Intelligence (AI) is rapidly transforming various facets of our daily lives, and education is no exception (Giannini, 2023; University of San Diego Online, 2024; Milberg, 2024). Today, AI technologies are revolutionizing the academic landscape, presenting unprecedented opportunities for personalized learning experiences, improved administrative efficiency, and enhanced educational outcomes (University of San Diego Online, 2024).



Defining AI and its Evolution

Definition: AI is the technology that enables computers and machines to simulate human learning, comprehension, problem-solving, decision-making, creativity, and autonomy (IBM, 2024). It's a field concerned with building machines that can reason, learn, and act in ways that typically require human intelligence (Google Cloud, n.d.). At its core, AI refers to the simulation of human intelligence in machines that are programmed to think, reason, and learn like humans (GeeksforGeeks, 2024).

Evolution: The concept of AI dates back centuries, but the modern field emerged in the 1950s. Key milestones include Alan Turing's "Turing Test" (1950), the coining of the term "artificial intelligence" by John McCarthy (1956), and the development of neural networks. Recent advancements, particularly in deep learning and large language models (LLMs), have led to significant breakthroughs. (IBM, 2024; GeeksforGeeks, 2024).

What is AI?

Artificial Intelligence (AI) is the ability of machines to replicate or enhance human intellect, such as reasoning and learning from experience. AI is a set of technologies that enable computers to perform advanced functions, including the ability to see, understand and translate spoken and written language, analyze data, and make recommendations.

Key components of AI include:

- **Machine Learning (ML):** Creating models by training an algorithm to make predictions or decisions based on data. ML algorithms learn from data without being explicitly programmed.
- **Natural Language Processing (NLP):** Programming computers to process and analyze large amounts of natural language data, enabling interactions between computers and humans using natural language. NLP allows machines to understand and respond to human language.
- **Computer Vision:** Enables computers to interpret and extract information from images and videos, similar to human perception.
- **Neural Networks:** Networks of algorithms that mimic the way neurons interact, allowing computers to recognize patterns and solve common problems in the fields of AI, machine learning, and deep learning.

While today's computers can analyze vast amounts of data much faster than humans, true AI means devices that can do everything humans can do and more.



Types of AI

Based on Capabilities:

- **Narrow AI (ANI)/Weak AI:** Designed for specific tasks (e.g., voice assistants, object recognition) (IBM, 2024; GeeksforGeeks, 2024). Narrow AI is about getting machines to do one task really well, like image recognition or playing chess (Abhishek, 2022).
- **General AI (AGI)/Strong AI:** Possesses human-level intelligence across a wide range of tasks. Currently theoretical (IBM, 2024; Abhishek, 2022; GeeksforGeeks, 2024).
- **Superintelligent AI (ASI):** Surpasses human intelligence in all aspects. Also theoretical (GeeksforGeeks, 2024; Google Cloud, n.d.).

Based on Functionality/Development Stage:

- **Reactive Machines:** React to stimuli based on preprogrammed rules (e.g., IBM's Deep Blue).
- **Limited Memory:** Uses memory to improve over time through training data. Most modern AI is considered to be limited memory. It can use memory to improve over time by being trained with new data, typically through an artificial neural network or other training model (Google Cloud, n.d.).
- **Theory of Mind:** AI that can emulate the human mind, understand emotions, and react in social situations. Currently non-existent.
- **Self-Aware:** AI aware of its own existence. Currently non-existent.

Machine Learning (ML) and Deep Learning (DL)

Machine Learning: A subset of AI where algorithms learn from data without explicit programming (IBM, 2024; Abhishek, 2022; GeeksforGeeks, 2024). Machine Learning (ML) makes computers learn from data and experience to improve their performance on some tasks or decision-making processes. ML uses statistics and probability theory for this purpose (Abhishek, 2022).

Deep Learning: A subset of ML using multi-layered neural networks to analyze data and deliver accuracy in tasks like object detection and language translation (IBM, 2024; Abhishek, 2022; GeeksforGeeks, 2024). Deep learning is a subset of machine learning that uses multi-layered artificial neural networks to deliver state-of-the-art accuracy in object detection, speech recognition and language translation (Abhishek, 2022).

Training Models: Supervised, Unsupervised, Semi-Supervised, and Reinforcement Learning (Google Cloud, IBM).

Generative AI (GenAI)

- **Definition:** Deep learning models that can create original content (text, images, video, etc.) in response to prompts (IBM).
- **How it Works:** Training (foundation model creation), Tuning (adaptation to specific applications), and Generation/Evaluation/Tuning (continuous improvement) (IBM, 2024).
- **Underlying Technologies:** Variational Autoencoders (VAEs), Diffusion Models, and Transformers. Transformers are at the core of most of today's headline-making generative AI tools, including ChatGPT and GPT-4, Copilot, BERT, Bard and Midjourney (IBM, 2024).





What is AI in Education (AIEd)?

AI in Education (AIEd) involves using AI technologies to enhance teaching and learning. Examples of AI applications in education include:

- **Adaptive Learning:** AI-driven platforms assess students' skill levels in real time and tailor instructional content to meet individual needs. Platforms like DreamBox and Smart Sparrow analyze student responses in real time to adapt lessons dynamically, enabling every student to master concepts at their own speed.
- **Automated Grading and Assessment Tools:** These tools use AI to evaluate assignments and provide detailed feedback, streamlining the grading process and saving teachers' time.
- **Intelligent Tutoring Systems:** AI-powered tutoring systems provide personalized feedback and support, adapting to individual learning styles and needs to help students understand complex concepts and improve academic performance.
- **Data and Learning Analytics:** AI helps analyze data from online learning portals, classroom attendance, and grades, providing insights into student performance.
- **AI-driven Chatbots:** Provide students with immediate support and assistance outside classroom hours.
- **Administrative Tasks:** AI assists in administrative tasks such as scheduling, budgeting, and resource allocation.
- **Online Discussion Boards:** AI enhances online discussion boards by moderating content, facilitating discussions, and providing personalized feedback.

Potential of AI in Education

AI offers numerous benefits that can revolutionize education:

- **Personalized Learning:** AI tailors educational content to each student's unique learning style and pace.
- **Teacher Support:** AI automates administrative tasks, reducing the workload on educators and freeing them to focus on student interactions.
- **Improved Accessibility:** AI-driven assistive technologies support students with disabilities, ensuring a more inclusive learning environment. AI tools can enhance inclusion and universal access to education in a number of ways, including helping to make global classrooms available to all, including those who speak different languages or who might have visual or hearing impairments.
- **Data-driven Decisions:** Educators and administrators can leverage AI to analyze vast amounts of data, providing insights that drive informed decisions and strategies.
- **Continuous Lifelong Learning and Professional Development:** AI supports continuous learning and professional development for educators by recommending personalized resources and courses.
- **Greater Scalability:** AI enables the scaling of educational programs to accommodate more students without compromising quality.

Challenges of AI in Education

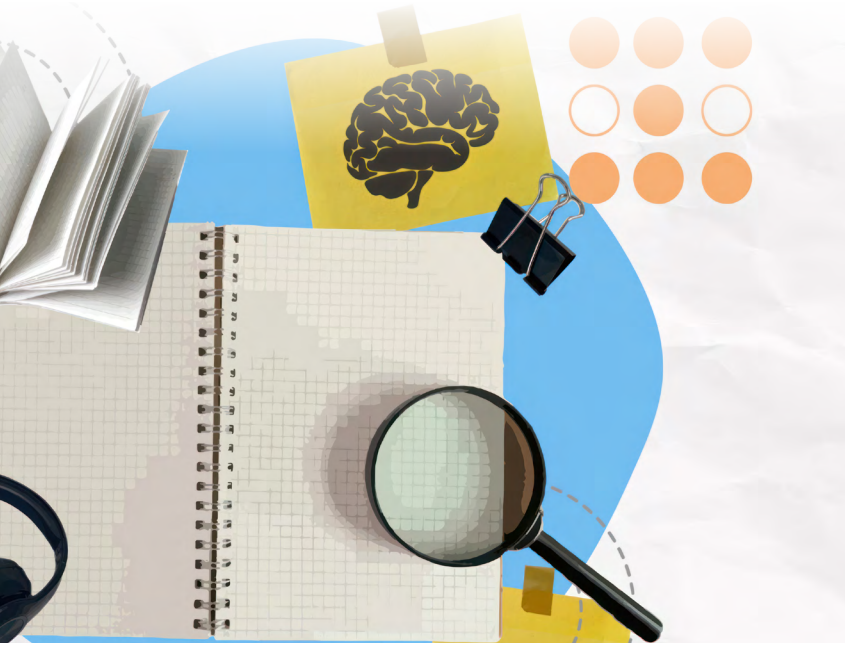
Despite its vast potential, AIEd also presents several challenges, including but not limited to:

- **Bias:** AI algorithms can perpetuate and amplify biases present in the data used to train them, leading to unfair outcomes.
- **Data Privacy:** The collection and use of personal data by AI systems raises significant privacy concerns.
- **Equity Gaps:** AI has the potential to exacerbate existing social and economic inequalities, as the benefits of the technology may not be evenly distributed.
- **Teacher Displacement:** There are fears that AI could replace teachers, leading to job losses and a decline in the quality of education.
- **Manipulation:** One of the primary and most readily apparent risks of AI is its potential to manipulate human users, especially children.

Preparing for an AI-powered Future

To harness the potential of AI while mitigating its risks, it is essential to:

- Emphasize AI as a tool to augment teachers, not replace them.
- Promote AI literacy among educators and students. Integrating AI into education is key to shaping tomorrow's workforce.
- Prioritize ethical considerations in the development and deployment of AI systems.
- Ensure AI-enabled educational innovations prioritize equity in their design. That means addressing disparities between genders, public and private schools, as well as catering to children with diverse abilities and learning styles, while removing language and access barriers.



Conclusion

The integration of AI in education holds immense promise, but it requires thoughtful and ethical implementation. By addressing the challenges and focusing on human-centered approaches, AI can enhance teaching and learning, making education more personalized, accessible, and effective. The subsequent chapters of this magazine will delve deeper into these topics, providing practical insights and guidance for educators, policymakers, and stakeholders.

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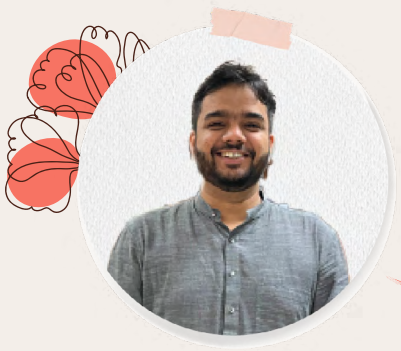
AI for Learner Flourishing:
A HISTORIC OPPORTUNITY



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Artificial Intelligence (AI) has swiftly taken center stage in global discussions on education, frequently making headlines. Powered by Large Language Models (LLMs) like ChatGPT, Gemini, Copilot, and Claude, AI tools now perform tasks once considered uniquely human, such as generating assessments, evaluating subjective answers, passing challenging exams, supporting writing, and engaging in natural conversation. These tools excel at analyzing vast amounts of data, identifying patterns, and executing repetitive tasks without fatigue. Increasingly ubiquitous, AI is becoming as common as word processors, accessible to anyone with an internet connection and a device, often through simple natural language prompts, giving rise to the emerging field of prompt engineering.

In educational settings, students turn to AI for help with explanations, assignments, and programming tasks, while educators use it to develop lesson plans and create content. AI can now readily offer personalized, interactive, and 24/7 learning experiences, which many students appreciate for their non-judgmental nature. Its potential to transform education is far-reaching: from tailoring instruction to individual needs to streamlining classroom management and delivery. AI can support teachers in adapting materials and methods, assist students who need extra tutoring, automate grading, and track progress.

Intelligent Tutoring Systems (ITS) are a prime example, providing scalable, personalized instruction and feedback while integrating assessment into the learning process. AI can also detect learning preferences, recommend suitable materials, or generate media tailored to explain complex topics. Furthermore, it can simulate practice environments that were once accessible only in high-stakes scenarios.

As AI evolves, it is increasingly viewed along a spectrum, from 'tool' to 'assistant' to 'companion.' Generative AI currently acts as a capable assistant, while future AI companions may enable more dynamic, mixed-initiative interactions. Overall, the integration of AI represents a significant advancement in our capacity to address the complex educational challenges of the 21st century.



While AI can perform a wide range of tasks, an important question arises: to what extent should learners depend on AI, and for which specific tasks should it be used, and in what manner? There are risks, such as overreliance on AI for tasks like summarizing texts, which might lead learners to miss important information and opportunities to enhance their comprehension skills. Similarly, cognitively offloading the writing process to LLMs could degrade written communication proficiency. Current AI tools are often not explicitly designed for learning, potentially breeding overreliance. Students are accessing content generated by LLMs based on statistical probabilities ('stochastic parrots') (Bender, Gebru, McMillan-Major, & Shmitchell, 2021), that are not quality-checked by an educator. LLMs have limitations, including making up information, providing wrong references, and perpetuating harmful stereotypes. Furthermore, ethical considerations and risks loom large. AI systems can inherit biases from historical data, potentially perpetuating inequalities and marginalizing disadvantaged students. Moreover, collecting and analyzing vast amounts of student data raises significant privacy and security concerns. There are also worries about the diminishing role of human educators.

However, AI cannot completely replace the mentorship, emotional intelligence, and ethical guidance teachers provide. The technocratic view, which sees technology as neutral and focuses on skills for the labour market, is critiqued for potentially reinforcing injustice and neglecting broader social contexts. Perspectives from the Global South highlight concerns about AI perpetuating digital neocolonialism, extractivist practices for materials, and reinforcing Western, patriarchal systems unless redesigned through participatory processes (Dahiya, 2023; Hao, 2022; Crawford, 2023; Mollema, 2024). These critical perspectives challenge us to rethink AI's role in education not merely as a tool for increased efficiency, but as a potential catalyst for more just, inclusive, and human-centered learning systems. This requires shifting the focus from technocratic solutions to deeper questions about the kind of future we want to co-create with AI.

AI, Education, and Learner Flourishing

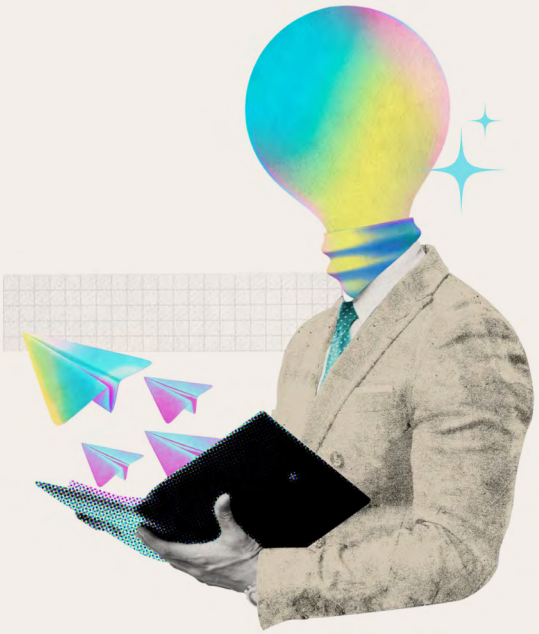
While conversations about AI in education focus on automation, personalization, and efficiency, a deeper and more urgent question lies beneath: Can AI help learners flourish, not just perform? To explore this, we must first return to the meaning of flourishing itself. De Ruyter, Oades, Waghid, Ehrenfeld, and Gilead (2022) synthesize human flourishing as the ongoing and optimal development of individuals' potential, which involves living well as a human being. This state is characterized by active engagement in meaningful relationships and activities that align with personal values and broader humanistic ideals. Flourishing, in this view, is not solely an internal process but is contingent upon individual contributions and an enabling environment. Seligman (2011) frames flourishing as a multidimensional concept rooted in positive psychology. Learner flourishing encompasses individuals' cognitive, emotional, social, and physical growth, emphasizing not just academic achievement but well-being, creativity, character development, and a sense of purpose.



In this context, flourishing learners are more than just well-trained students; they are emotionally balanced, socially aware, intellectually curious, and resilient individuals. This vision of education aligns closely with foundational global commitments. Article 26(2) of the Universal Declaration of Human Rights (United Nations, 1948) articulates that, "Education shall be directed to the full development of the human personality and the strengthening of respect for human rights and fundamental freedoms." This powerful affirmation reminds us that education, at its core, is a human endeavour. The authors contributing to this issue of BlueDot advocate for a return to that foundational purpose.

They propose a vision of education that goes beyond achievement metrics to prioritize flourishing in its fullest sense, an education that cultivates the whole learner. Learning should not merely be about mastering subjects but about becoming self-aware, collaborative, ethically grounded, and adaptable in a rapidly changing world.

To revive learner flourishing is to reimagine education not as a production line of standardized outcomes, but as an ecosystem where each learner grows with care, purpose, and the freedom to explore their full potential. This vision calls on educators, policymakers, technologists, and communities to restore the deeper purpose of education in an age increasingly shaped by AI. Flourishing in this context means more than adapting to new tools; it requires equipping students with the critical capacity to interrogate, influence, and reimagine the technologies shaping their world. Therefore, AI literacy must empower learners to understand how these systems affect society and the environment, and to envision alternatives rooted in values like equity, care, and sustainability.



AI's Role in Fostering Learner Flourishing

The concept of learner flourishing extends education's aims beyond traditional metrics of achievement to encompass holistic human development, equipping individuals not only with knowledge and skills but also with the capacity to live meaningful, autonomous, and compassionate lives. Contrary to popular skeptical belief, AI can support this transformation, particularly in developing emotional and social capacities.

Historically, AI in education has been employed to optimize efficiency, automate grading, personalize content delivery, or manage administrative tasks. However, a more transformative potential lies in its capacity to augment the deeply human aspects of learning: motivation, reflection, self-regulation, and social engagement. When designed with learner flourishing at its core, AI can respond to each learner's evolving needs, preferences, and emotional states. For example, intelligent tutoring systems (ITS) powered by AI can provide real-time scaffolding for problem-solving tasks, encouraging learners to persist through challenges rather than giving up. Rather than simply correcting errors, such systems can guide students to reflect on their reasoning, thereby supporting metacognition, a key component of flourishing. These systems can also celebrate progress and effort, helping build a growth mindset strongly correlated with academic and emotional well-being (Mehigan & Pitt, 2019).

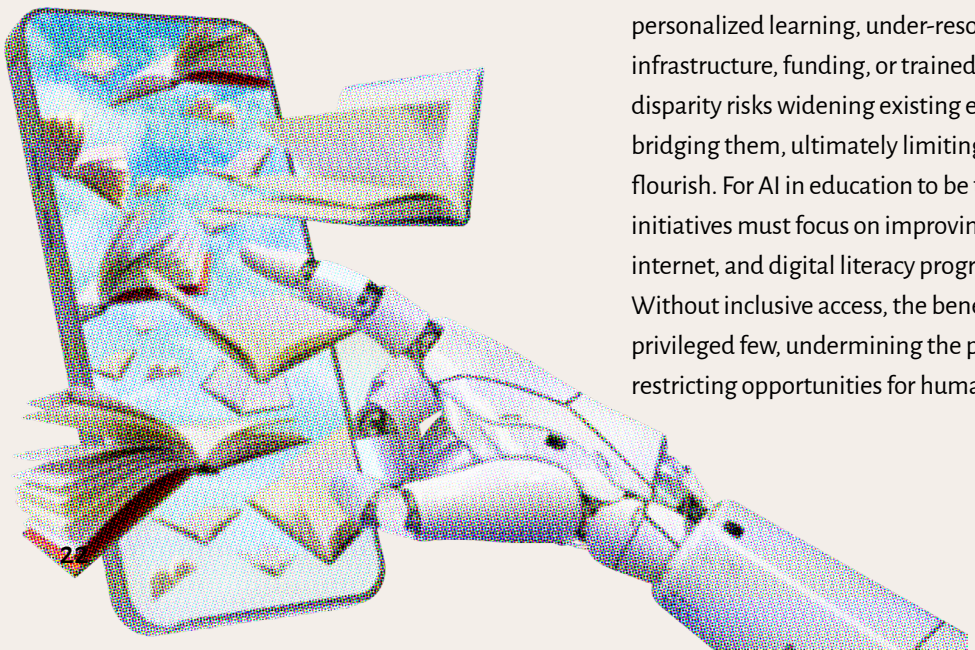
Further, AI can support the development of social and emotional skills, such as empathy, emotion regulation, and collaboration, which are foundational to flourishing. Emotion-aware systems, for instance, can analyze vocal tone, facial

expressions, or keystroke dynamics to detect frustration, boredom, or confusion (Bosch et al., 2016). In response, they can adjust the pacing of instruction, introduce motivating elements, or prompt the learner to take a reflective pause. Conversational agents or affective chatbots can simulate peer or mentor interactions, providing not only academic support but also socio-emotional encouragement (Nguyen, 2022). For learners who may be marginalized, introverted, or anxious in traditional settings, these systems offer a non-judgmental space to explore ideas and express themselves. Over time, such interactions can strengthen emotional literacy and social confidence.

Flourishing cannot occur in environments that are inequitable or exclusionary. AI can play a pivotal role in promoting inclusion by adapting to learners with diverse linguistic, cultural, neurocognitive, or socio-economic backgrounds. For instance, AI can provide real-time translation or accessibility features (such as text-to-speech or adaptive interfaces) for learners with disabilities (Bercaru & Popescu, 2024). When developed with input from diverse communities and trained on representative data, AI systems can affirm multiple ways of knowing and support learners across a wide range of experiences. Yet realizing this vision is not without complexity. The same technologies that offer promise can also reinforce existing biases or create new forms of exclusion if not carefully designed and critically examined. Understanding the risks, biases, and unintended consequences is essential if we are to build AI systems that genuinely serve all learners.

Challenges and Ethical Considerations

The rapid integration of AI in education provides immense potential to transform learning experiences, but it also brings forward critical challenges and ethical considerations that must be addressed to ensure reasonable, fair, and secure implementation. One primary concern is the digital divide, highlighting the gap in access to AI technologies among students from different socio-economic backgrounds. While affluent schools may adopt AI-driven platforms to enhance personalized learning, under-resourced institutions often lack the infrastructure, funding, or trained personnel to do the same. This disparity risks widening existing educational inequalities rather than bridging them, ultimately limiting the capacity for all learners to flourish. For AI in education to be truly transformative, policies and initiatives must focus on improving access to technology, reliable internet, and digital literacy programs for marginalized communities. Without inclusive access, the benefits of AI will be confined to a privileged few, undermining the principle of educational equity and restricting opportunities for human flourishing.



Another pressing issue is bias in AI algorithms, which can significantly impact fairness and inclusivity in educational settings. AI systems are trained on historical data, which may carry inherent human biases based on race, gender, socio-economic status, or cultural background. When such biases are embedded in the algorithms used for grading, recommendations, or admissions, they can continue the unfair practices rather than eliminate them. For instance, an AI tool designed to predict student performance might undervalue students from underrepresented backgrounds if the training data was skewed. Unchecked bias not only reinforces systemic inequalities—it can also limit a student's sense of agency, belonging, and social awareness within educational spaces. To mitigate this, developers must ensure that AI models are built with diverse, representative datasets and that continuous audits are conducted to identify and correct bias. Additionally, transparency in how AI systems make decisions is crucial so that educators and students can understand and trust AI-generated outcomes. Ethical design practices and human oversight should be integral components of AI development in education to uphold fairness and accountability.



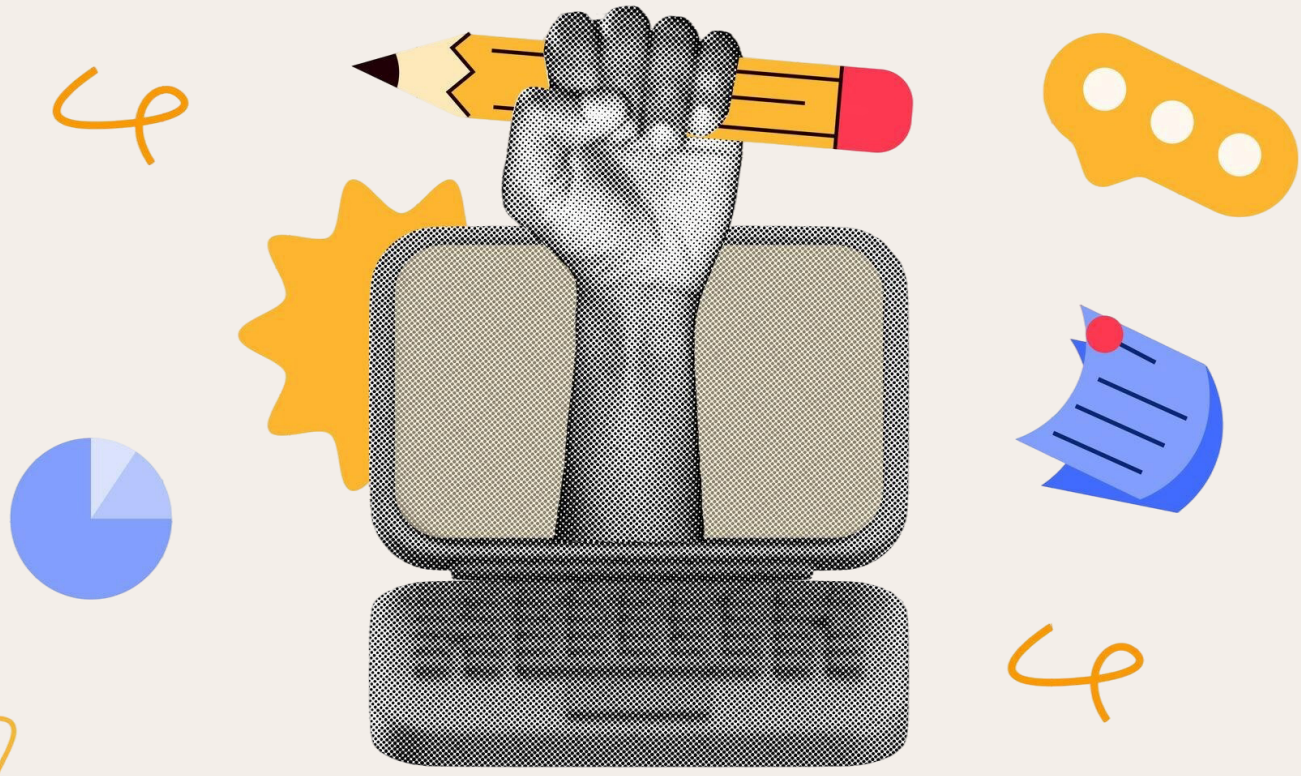
Equally important is the issue of data privacy and security, especially when dealing with sensitive student information. AI-powered educational tools often collect vast amounts of data to personalize learning experiences, including academic performance, behavioural patterns, and even biometric data in some cases. This raises significant concerns about how data is stored, who has access to it, and how it might be used or misused. A breach in data security could compromise students' privacy, expose them to long-term risks such as identity theft or surveillance, and threaten their well-being. Therefore, it is essential to implement robust data protection measures, adhere to legal frameworks like the General Data Protection Regulation (GDPR) or the Family Educational Rights and Privacy Act (FERPA), and ensure transparency in data handling practices. Students and parents should be informed about what data is being collected, the purpose of its use, and their rights regarding consent and deletion. Moreover, data minimization, collecting only what is necessary, should be a standard practice to reduce exposure to potential threats.

In conclusion, while AI holds the promise of transforming education by making it more personalized, efficient, and accessible, it also introduces complex ethical dilemmas that require careful navigation. Bridging the digital divide, addressing algorithmic bias, and safeguarding student data are not optional tasks but foundational responsibilities in the ethical deployment of AI in education. All the stakeholders must work together to ensure that AI serves as a tool for empowerment rather than exclusion.

The Way Ahead

The real promise of AI in education lies not in automation, but in its potential to reorient learning around what truly matters: the flourishing of every learner. This requires reimagining what constitutes valuable knowledge, how to cultivate inclusion, and how to define and measure growth. As we face 21st-century challenges like climate uncertainty, social fragmentation, and technological disruption, we must consider whether AI will help education rise to meet these complexities or simply reinforce outdated models under the guise of innovation. Will it disrupt inequities or silently reproduce them through biased data and design? Will it open new pathways for engagement, curiosity, and learner autonomy, or drive behavioural shifts toward passivity and compliance? And as AI takes on more instructional and administrative tasks, will it create space for educators to cultivate richer human relationships, or gradually diminish their role in shaping learning?

The way forward demands more than technical innovation. It calls for ethical clarity, cultural awareness, and a commitment to designing with and for diverse communities. To ensure AI contributes meaningfully to learner flourishing, we must invest in comprehensive AI literacy for students, educators, and administrators. We need robust ethical guidelines that foreground fairness and inclusivity, and a strong commitment to human-centered design that protects learner agency and supports holistic development. Learner flourishing is not an outcome AI can produce on its own, but it can be the compass that guides how we shape education using this powerful tool.





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OPINION

The Leap Towards 21st Century Problem-solving in Teaching, Learning Spaces

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In an era marked by rapid technological advancements and complex global challenges, the education sector finds itself at a crossroad. The integration of Artificial Intelligence (AI) in higher education presents a compelling paradigm shift in how we approach teaching, learning and problem-solving. As we delve into this topic, we must ask: is AI the big leap required in the education system to respond to complex, ever-changing twenty-first century problems?

The changing landscape of education

The traditional model of education, focused primarily on knowledge transfer, is rapidly becoming obsolete. A striking example of this shift is the phenomenal success of ChatGPT, an AI language model that garnered 100 million users within just two months of its release in late 2022 (Milmo, 2023) without any formal training provided to these users. This unprecedented access to information and AI-assisted learning has dramatically altered our educational priorities.

In this new paradigm, the value of our human intellect lies not in the ability to memorize facts or perform routine tasks, but in our capacity for curiosity, inquisitiveness and critical thinking. These uniquely human traits will be the cornerstone of our relevance in an AI-augmented world.

AI-powered learning experiences

The integration of AI in education promises to revolutionize the learning experience itself. We are moving towards a future of:

1. **Personalized learning:** AI-driven learning systems and tutors will create customized educational journeys for each student, catering to individual learning styles and interests.
2. **Immersive technologies:** Virtual and augmented reality will make learning more interactive and engaging, allowing students to experience complex concepts in three-dimensional space.
3. **Global collaboration:** AI-powered platforms will facilitate collaboration among students and researchers worldwide, enabling them to solve grand challenges together.
4. **Real-world application:** The lines between formal education and real-world problem-solving will blur, as AI helps bridge the gap between theoretical knowledge and practical application.

The Human-AI partnership

As AI becomes more prevalent in education, the role of humans is evolving rather than diminishing. We are entering an era of 'co-intelligence' (Wilson and Daugherty, 2018), where human creativity and intuition work in tandem with AI's data processing and pattern recognition capabilities. This symbiotic relationship will be crucial in tackling the complex problems of the twenty-first century.

In this context, AI literacy will become as fundamental as reading and writing. It will be essential for everyone to understand how AI systems work, their capabilities and limitations, and the ethical considerations surrounding their use. The next generation of skills will centre on solving complex problems through critical thinking, creativity, and optimization, areas where humans, augmented by AI, can truly excel.



Advancements in AI models

AI models themselves are becoming increasingly sophisticated. They are faster to train, capable of processing more data, and adept at handling complex, context-dependent queries. Large language models can now understand and generate human-like text across a wide range of topics and styles, while computer vision models can analyse images and videos with remarkable accuracy.

Perhaps most importantly, these models are increasingly able to explain their 'thinking process', making them more transparent and trustworthy (Ericsson, 2021). This explainability is crucial for the adoption of AI in sensitive areas, such as education and healthcare.

The role of data

In the AI-driven educational landscape, data takes on new significance. It becomes a living entity, constantly growing and evolving. Data is emerging as the new metric of wealth, both for individuals and organizations. Those who can effectively collect, analyse, and utilize data will gain significant advantages.

When considering data in the context of AI and education, we need to focus on the five Vs:

1. **VOLUME:** The sheer amount of data being generated is staggering.
2. **VALUE:** Discerning valuable data from noise is crucial.
3. **VARIETY:** Data comes in many forms – text, images, video, sensor readings, and more.
4. **VELOCITY:** The speed at which data is generated and needs to be processed is increasing.
5. **VERACITY:** Ensuring the accuracy and reliability of data is paramount.

Societal implications

The integration of AI in education has broader societal implications that cannot be overlooked. As a society, we must collectively decide how to use the data we generate and collect, balancing the benefits of AI with concerns about privacy and data rights. We need to accept AI as an integral part of our society and understand both its potential and its limitations.

Our world is shifting from what was described as VUCA (volatile, uncertain, complex, and ambiguous) to what some are now calling BANI (brittle, anxious, nonlinear, and incomprehensible) (Kraaijenbrink, 2022). AI, through education, can help us navigate these changes.

- In a brittle world, AI can help build resilience through predictive modeling and risk assessment.
- When faced with anxiety, AI can provide data-driven insights to inform decision-making and planning.
- In a nonlinear world, AI can help us understand complex systems and adapt to rapid changes.
- When confronted with the incomprehensible, AI can assist in breaking down complex problems into manageable parts.

Ethical considerations and risks of AI in education

While AI presents transformative opportunities in education, its implementation also comes with significant risks and ethical dilemmas that must be critically examined. One major concern is the potential for bias in AI-driven systems. Machine learning models, including those used in education, are trained on historical data that may inadvertently reinforce existing biases. If not carefully designed and monitored, AI-based learning platforms can perpetuate inequalities, favouring students from privileged backgrounds while marginalizing others. Addressing this issue requires continuous evaluation, transparent algorithms, and inclusive datasets that reflect diverse educational needs.

Another pressing challenge is the question of data privacy and security. AI-powered learning environments generate and analyse vast amounts of student data, raising concerns about how this information is collected, stored, and utilized. Without stringent data protection policies, sensitive student information could be misused or exploited, resulting in ethical and legal ramifications. Institutions must prioritize robust cybersecurity measures and adhere to strict data governance frameworks to ensure that AI applications in education uphold students' rights and privacy.

Beyond bias and data security, the increasing reliance on AI in education raises concerns about the diminishing role of human educators. While AI can enhance personalized learning, it cannot replace the mentorship, emotional intelligence, and ethical guidance that human teachers provide. A balanced approach is necessary, one that integrates AI as a tool to support rather than supplant human educators. Educational institutions must foster AI literacy among teachers and students alike, equipping them with the skills to critically engage with AI tools rather than passively relying on them.

Balancing benefits and risks: a stakeholder perspective

The adoption of AI in education necessitates a careful evaluation of trade-offs by all stakeholders – learners, educators and policymakers. Students must weigh the benefits of personalized, adaptive learning against potential challenges, such as over-reliance on AI-generated content and reduced opportunities for organic peer interactions. Educators must navigate the complexities of integrating AI-driven assessment tools while ensuring that human judgement remains central to evaluating student progress.

Policymakers play a crucial role in establishing regulatory frameworks (Das et al., 2023) that balance innovation with accountability. Key questions must be addressed: how can AI be leveraged to enhance education without exacerbating digital divides? What policies should be in place to ensure transparency in AI decision-making processes? To build a responsible AI-driven educational landscape, collaboration across the academia, industry and regulatory bodies is essential. Ethical AI adoption should be guided by principles of fairness, inclusivity, and human-centred learning.



The call to action

As we stand at this pivotal moment in education, there is a clear call to action for educators and institutions:

1. **Embrace AI integration** in curricula and administration, moving beyond surface-level applications to deep, meaningful use of AI tools.
2. **Develop comprehensive AI literacy** programmes for students and faculty, fostering a deep understanding of AI's capabilities, limitations, and societal impact.
3. **Foster ethical AI** use through open discussions and clear guidelines, ensuring that its use in education aligns with human values and promotes equity and inclusivity.
4. **Reimagine assessment methods,** moving towards AI-assisted, project-based evaluations that better reflect the complex, collaborative nature of real-world problem-solving.
5. **Advocate for AI-friendly policies in education**, engaging with policymakers to create frameworks that encourage innovation while protecting individual rights.
6. **Prepare students for an AI-driven workforce**, regardless of their field of study, by integrating AI-related skills and knowledge across all disciplines.





The future of higher education

As we look to the future, we see a seismic shift in the purpose and methods of education. Learning will increasingly focus on solving complex, multifaceted problems for which there are no pre-existing answers. Climate change, pandemics, social inequality – these are the kinds of challenges our students must be prepared to tackle. Our knowledge base will become increasingly data-driven, with AI systems helping us to process and analyse vast amounts of information at unprecedented speeds.

The future of higher education is not just about adapting to AI; it is about harnessing its power to create more effective, engaging and equitable learning experiences. It is about preparing our students not just for the jobs of tomorrow, but for the challenges our world will face in the coming decades.

Conclusion

In conclusion, AI indeed represents a significant leap forward in our ability to respond to the complex, ever-changing problems of the twenty-first century. However, it is not a panacea. The true power of AI in education lies in its ability to augment human intelligence, creativity and problem-solving skills.

As we embrace this AI-driven future, we must remember that the goal of education remains unchanged: to cultivate curious, critical-thinking individuals capable of tackling the world's most pressing challenges. AI is a powerful tool in this endeavour, but it is the human element , our creativity, empathy and ethical judgement, that will ultimately guide us in using this tool wisely and effectively.

The integration of AI in education is not just an opportunity; it is a necessity if we are to prepare the next generation for the complexities of the twenty-first century. By embracing this change and actively shaping the future of AI in education, we can create a learning ecosystem that is more responsive, inclusive, and capable of addressing the grand challenges of our time.

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Unfolding Tensions of Generative Artificial Intelligence in Education

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The widespread adoption of generative Artificial Intelligence (AI) tools has ignited a substantial debate regarding its impact on education. Noteworthy discussions in both the media and scholarly articles emphasize the dual nature of these impacts, presenting both challenges and opportunities (Giannakos et al., 2024). The decision-making process for educators and academic institutions in adapting to this new technological landscape is complex. This complexity arises from various tensions that need to be navigated.

Tension 1
Responsibility of institutions and educators

One of the foremost responsibilities of educational entities is to provide our students with the best learning opportunities possible. If certain tools can enhance these opportunities, it is our obligation to consider them. Just as we expect our doctors to use the latest diagnostic and treatment tools to offer the best possible care, we must embrace educational technologies that benefit learning processes. Conversely, if the application of these tools detracts from educational outcomes or presents significant negative implications, they must be rejected. Educational institutions should establish support structures to enable teachers to utilize these tools responsibly and effectively.

Tension 2
The uniqueness of generative AI and the 'illusion' of detection

The widespread adoption of Artificial Intelligence – particularly through systems such as recommendation or recognition technologies – is not a novel phenomenon. However, generative AI introduces a new dimension through its ability to create new content across various mediums, including text, images, audio, and video. This innovation poses unique challenges to education, particularly when discerning whether content has been generated by humans – potentially our students – or machines.

The concept of the 'illusion of detection' that I have discussed over the past year warrants further exploration. It refers to whether educators' aspirations to identify AI-generated content will be realized. However, this might prove difficult to guarantee, as students become increasingly adept at crafting prompts that make detection difficult. Moreover, there is the possibility that any advanced AI language detector could be circumvented by an equally sophisticated AI language generator. The Council of the European Union (2024) is actively pursuing regulations to ensure that AI-generated content is appropriately marked. However, the efficacy of implementing these regulations remains to be seen.



Tension 3
The challenge of keeping pace

The rapid evolution and proliferation of generative AI tools – along with their diverse applications – present significant challenges in staying informed about the latest developments. On the one hand, keeping abreast of these advancements requires considerable time and effort. On the other, a perceived lack of autonomy and proficiency in using these tools can lead to stress and frustration among educators. This is especially pertinent considering the responsibilities educators hold (as noted in Tension 1) and the potential misuse by students (as highlighted in Tension 2). Without proper support, even the most dedicated teachers may find themselves overwhelmed.

Tension 4
Human limitations also shape generative AI's constraints

Generative AI functions by identifying patterns in large datasets – typically created and curated by humans – and refining these patterns through human-led corrections. Mathematical models are developed from the inferred correlations that can generate new content that complies with a given context or specific instructions, mimicking the patterns observed in the content it was trained with.

There are two significant ways in which human limitations influence generative AI: a) the biases and errors present in the training data reflect human imperfections, and b) the efficacy of generative AI is limited by the quality of context and instructions (prompts) provided by users, impacting the relevance and accuracy of the generated content.

The promotion of AI literacy is crucial to address these issues (Theophilou et al., 2023). Understanding AI's limitations enhances our ability to provide more precise instructions and assess AI-generated content critically. The deeper our knowledge of a subject, the better we can interact with AI, creating more meaningful and accurate outputs. There is thus a growing need for a sophisticated understanding and critical analysis of AI-generated content among users.

Tension 5
The future of young people and reevaluating competencies

There is much discussion about how the proliferation of generative AI tools will increasingly influence the future of professions and the lives of young people. Media headlines often feature statements such as, 'AI makes a difference at work', or 'It's not that Artificial Intelligence will completely replace people in their jobs, but those who learn to use it will have a significant advantage'. While the full impact remains to be seen, changes are already evident in some fields, such as software development, translation and creative design.

In this context, the scientific community (Markauskaite et al., 2022; Benvenuti et al., 2023) suggests two complementary perspectives for rethinking the competencies that should be emphasized in training programmes across various disciplines.

One perspective involves integrating opportunities to develop the ability to interact with AI tools – both general and discipline-specific – in an informed and critical manner. This approach aims to enhance 'human' performance by incorporating authentic learning activities connected to real-life problem-solving, where AI tools are accessible.

The other perspective focuses on bolstering opportunities to cultivate uniquely 'human' skills that are less susceptible to automation. Humans possess the ability to generate content that is probabilistically unpredictable; we have intuition, morality, intentions, emotions, and judgement – all of which transcend mere intellectual capabilities.

Each discipline should identify where it is necessary to emphasize these perspectives.



Tension 6: Opportunities for improvement vs risks and ethical implications

This tension encapsulates multiple considerations when deciding whether to integrate generative AI tools into educational activities. These considerations span potential benefits and opportunities for improvement as well as risks and ethical implications (Yan et al., 2024; Hernández-Leo & Ginoyan, 2025).

OPPORTUNITIES
INCLUDE

Effectiveness: This involves enhancing the depth and retention of learning. For instance, while AI-generated texts may be unreliable and biased, analysing these drafts challenges students to critically evaluate the content, deepening their learning experience.

Efficiency: AI can streamline the learning process. For example, AI tools proficient in text correction can rapidly provide feedback on spelling, grammar and coherence, complementing traditional teacher feedback and optimizing learning time.

Motivation: AI can foster curiosity and enthusiasm through personalized learning experiences and interactive activities, such as dialogues with AI that simulate historical figures, or prototyping in project development. When leveraged effectively, these tools can enhance intrinsic motivation and lead to more engaging learning experiences.

Developing new competencies: Often referred to as real-life skills, this aligns with the issues raised in Tension 5. Numerous professions are now integrating AI as a work tool, enhancing productivity and the quality of outcomes. The application of generative AI tools in learning tasks not only fosters the design of more authentic activities (in terms of 'real-life' relevance) but also cultivates the ability to engage with AI in an informed and critical manner.

RISKS AND ETHICAL IMPLICATIONS
INCLUDE

Academic integrity and substitute for learning: There is a risk that students might use AI tools to circumvent genuine learning opportunities, impacting their academic integrity and learning.

Critical usage: Non-critical use of AI can perpetuate and reinforce biases and erroneous claims due to the inherent uncertainties present in AI-generated content.

Ethical concerns: The ethics of AI tool deployment relate to the motivations and operation of the organizations providing these tools, including issues of commercial exploitation, power concentration, and the potential to shape societal progress.

Other factors: Privacy, environmental impact, and the exacerbation of inequalities are critical considerations. The latter requires greater knowledge to effectively utilize AI tools (as discussed in Tension 4) and economic disparities posing access difficulties to more advanced features, such as premium services.

Tension 7: Redesigning assessment – from control to integral to the learning process

In Tension 7, we explore the influence of Tension 2, which addresses the potentially false 'illusion of detection'. This issue – while seemingly new – has historical parallels, such as plagiarism, and advances in educational assessment research (Knight and Ferrer, 2022). We need to devise creative methods to evaluate how students engage with and benefit from their participation in learning processes. Particularly when incorporating generative AI tools, it is critical to acknowledge that effective human–AI interaction demands significant (human) effort, especially in educational settings. Consequently, the emphasis on assessing the learning process – rather than just outcomes – becomes increasingly critical.

Tension 8: The rights of young people – provision, protection, participation

Tension 8 examines the previous tensions through the lens of human rights, particularly those of young people. This tension serves as a complement to Tension 1, concerning the responsibility of institutions and educators. It underscores the rights of new generations to access the best educational opportunities in an AI-integrated world. This right extends beyond mere educational provision to include safeguarding their protection and actively involving them – and their communities – in decision-making processes regarding the design and use of AI in their activities (Hernández-Leo, 2022; Beardsley et al., 2024).

In conclusion, the integration of Artificial Intelligence in educational settings requires that institutions establish support structures to cultivate new skills and reformulate assessment. It is fundamental to maximize the potential benefits of generative AI and minimize its risks and ethical implications, ensuring that human interactions with these technologies are beneficial.

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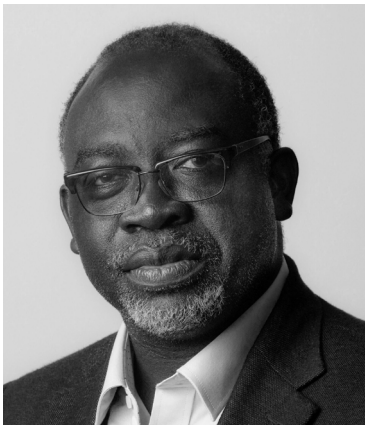
The Role of AI in Education and Its Impact on Learners

Adegboyega Ojo



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Artificial intelligence (AI) is increasingly being recognized as a general-purpose technology, with its integration into various sectors of the economy—including education—accelerating rapidly. In the educational sphere, AI has the potential to transform teaching practices, personalize learning experiences, and enhance the management and delivery of education (Miao et al., 2021).

Apart from these areas, AI is also expected to have a significant impact on the future of work and competency requirements (JRC-EC, 2018). As educational systems in different parts of the world adapt to equip citizens with the competencies needed to participate in the future economy, AI is expected to play a critical and continuous role in supporting students in acquiring these skills (Tuomi et al., 2018). According to the EU Digital Competence Framework for Citizens, key digital skills include information and data literacy, communication and collaboration, and problem-solving. Furthermore, AI is expected to play a pivotal role in accelerating progress towards attaining Sustainable Development Goal 4 – ensuring inclusive and equitable quality education and promoting lifelong learning opportunities (Miao et al., 2021). Despite these promising developments, challenges remain in harnessing AI's full potential in education.

Potential impact of AI on learners

AI holds significant promise in terms of enhancing teaching effectiveness and improving learner outcomes by enabling personalized, self-paced, accessible and inclusive learning (WEF, 2024). It can substantially impact educational tasks in schools by aiding in adapting teaching methods and instructional materials to meet students' varying needs, assisting students who require additional tutoring support, grading tests and assignments, and evaluating student progress (JRC-EC, 2018). Generative AI – such as OpenAI's ChatGPT or Google's Gemini – can generate new content such as text, images, video, audio, and computer code based on textual inputs called prompts. These generative capabilities can help teachers create personalized study plans and materials for individual students or groups.



Building on these applications, AI also directly enhances student learning through tools such as intelligent tutoring systems (ITS). These systems are among the most common examples of AI applications in education (Miao et al., 2021). ITS enables one-to-one tutoring at scale, providing personalized, timely feedback to support learners (Chan, 2023; Wang et al., 2024) and help predict learning performance (Xu and Ouyang, 2022). By monitoring learners' progress, ITS can help them achieve their goals. In addition, ITS fundamentally transforms assessments (Cope et al., 2021). In traditional learning environments, assessments typically happen at the end of instruction, with outcomes determined retrospectively by the learner's ability to recall and apply information. In contrast, AI-powered ITS integrates assessments directly into the learning process (Cope et al., 2021).

Moreover, ITS leverages learning analytics to provide information on learning progress and develop optimal, individualized learning pathways (Cope et al., 2021; Wang et al., 2024). Finally, ITS enhances instructor–learner interactions by monitoring and analysing student behaviour to increase engagement (Seo et al., 2021; Xu and Ouyang, 2022).

In learning environments, AI enables the detection of learning styles and provides suitable learning materials in various presentation formats (Wang et al., 2024). By leveraging generative AI's advanced reasoning, planning, and multi-modal content generation capabilities, ITS can create innovative targeted media – both proactively and on demand – to enhance learners' understanding of complex concepts and problem-solving skills (Almasri, 2024).

Generative AI can be used to simulate practice environments earlier found only in high-stakes settings – such as emergency response, aviation, or military training – making them accessible to learners in low-stakes settings for skill development. Proofs-of-concept have demonstrated the potential of these simulated learning environments in K-12 teacher training and entrepreneurial pitching (Mollick et al., 2024). Integrating these simulated practice environments with ITS will enable highly personalized, immersive learning experiences that adapt to individual learner needs and provide real-time feedback, fundamentally reshaping how complex skills are taught and mastered.

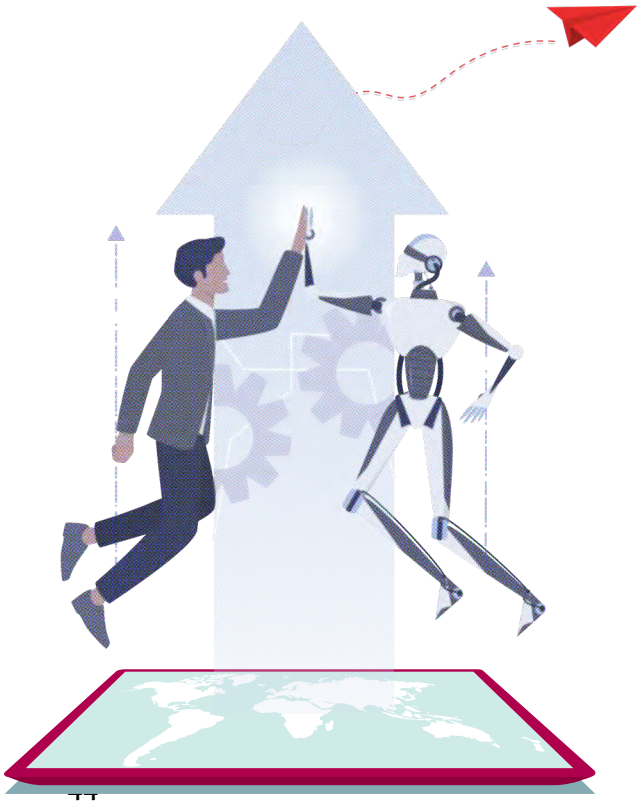


Challenges to realizing AI's full potential in education

The use of AI in transforming education raises several important questions, including: how can we design AI educational tools at scale while upholding the social and human dimensions of education (Guilherme, 2019)? What policies will ensure that access to AI in education is both equitable and inclusive (Miao et al., 2021)? What governance mechanisms will ensure that AI-assisted learning environments are safe and ethical and 'teacher-in-the-loop' (Seo et al., 2021)? How do we prevent the commodification of learner data and protect student privacy (Zembylas, 2021)? How is AI in education impacting educational outcomes (Miao et al., 2021)? We describe some of these issues in this section.

Delivering personalized learning at scale while upholding core educational values

Key aspects of a well-rounded education include preserving character formation and fostering social responsibility to develop learners who are active community members (Guilherme, 2019). This requires facilitating collaborative learning and guided discovery – both critical components for an optimal learning experience on these platforms (Miao et al., 2021). Evidence further suggests that the quality of student–teacher relationships significantly impacts academic achievement (Guilherme, 2019), underscoring the need for learning platforms to cultivate this relationship. Students' emotional and social development and well-being must also be considered, as AI tools should support – and not replace – the empathy and emotional intelligence that teachers bring to the classroom.



Providing inclusive and equitable access to AI in education

Without actively preventing the exclusion of disadvantaged groups, adopting AI applications in education can further the digital divide (Bentley et al., 2024). Thus, to avoid a possible 'AI divide' – in which some groups will have greater access to AI benefits than others – policies in education must include ways of deploying AI inclusively and in a gender-equitable fashion (Miao et al., 2021). From an equity perspective, an AI-powered learning environment should actively work to prevent bias in the personalization of learning (Almasri, 2024). Such biases may arise when stereotypes about specific groups of learners are embedded into the curriculum and content, resulting in recommendations that fail to align with students' actual capabilities (Baker and Hawn, 2022).

Establishing a governance framework for the ethical use of AI in learning and education

The educational context is not exempt from the ethical challenges posed by AI systems; they can profoundly impact student development as they develop critical thinking skills. For instance, AI governance must tackle digital neocolonialism – perpetuating colonialism through digital technologies such as learning platforms – as they serve content and explain complex social issues without considering the learners' cultural context. This governance framework must also prevent the commodification of learners and protect student privacy (Department for Education, 2023; Zembylas, 2021). An example of this is ensuring informed consent before collecting and using data on learning platforms (Miao et al., 2021). Although there is emerging evidence that generative AI used to augment or support human tasks does not necessarily diminish individuals' ability to perform these tasks independently (Bar-Gill et al., 2023), AI governance in education must strive to protect human agency from possible harm due to prolonged interaction with AI (Chan, 2023; Department for Education, 2023; Seo et al., 2021). Furthermore, safety concerns such as violations of social boundaries in online learner–instructor interactions (e.g. AI systems tracking eye or facial expressions to measure unconscious behaviours), also require attention (Seo et al., 2021).



Assessing the impact of AI in education to inform evidence-based approaches

The introduction of AI in education requires empirical evidence on how AI technologies impact instructional practices, assessment strategies, and administrative processes within educational systems (Almasri, 2024). Although several studies have examined the use of AI in education, they have focused on its technical affordances rather than its learning outcomes. Additionally, a deeper understanding of AI's scalability and associated costs is necessary (Miao et al., 2021) to ensure sustainable implementation and equitable access. It is also essential that these impacts are disaggregated to reveal when (context) and for whom (groups) AI is making a positive difference in learning. The context includes factors such as the level of education, and education system elements such as instructional practices or administrative processes. The question of whom it impacts encompasses not only specific socio-demographic factors but also their intersectionality, and must highlight how AI interventions influence those with overlapping identities.

Achieving learner flourishing with AI

AI should effectively transform educational systems to help them provide inclusive, equitable, collaborative, and lifelong learning, improve learning outcomes, and achieve learner flourishing. To fully harness the potential of AI in education, it must be used not only to transform current practices but also – and more importantly – to achieve goals that are currently unattainable due to limitations in traditional pedagogical methods, resource constraints, and systemic barriers within the education system. One such goal is equipping students at different levels with the skills and competencies needed for the future workforce and economic activities. Rather than focusing solely on learner-centred individualized optimization of instructions and contents within narrow domains, the vision for future education should be centred on collaborative flourishing, where knowledge is co-created through interdisciplinary practices and cross-domain skills (D'Mello et al., 2024).

Governments need to approach policies for AI in education with a balanced, holistic perspective. Such policies should outline the principles and goals underpinning AI in education, strategies for achieving equitable, inclusive and ethical use of AI, plans for developing AI and data literacy among teachers and students to enable them to harness AI effectively, and a framework for testing, monitoring and evaluation to build an evidence base, among other considerations. It is also crucial to align AI-in-education policies with broader digital strategies to reduce and eliminate the digital divide in society.

Conclusion

AI holds the potential to transform educational systems, equipping learners with the skills and competencies essential for joining the workforce and tackling the societal challenges of the twenty-first century. While new technologies have historically tended to widen equity gaps and deepen the digital divide, thoughtful and inclusive AI-in-education policies can help mitigate these risks. Emerging evidence from AI applications in other sectors suggests that when effectively integrated, AI can help narrow performance gaps among learners. However, before implementing and fully harnessing AI's potential, teachers, students, and education administrators must acquire data and AI literacy. Classroom pedagogies should also evolve to support collaborative learning, with AI positioned as a partner or 'co-pilot' to both students and teachers. Finally, governments must establish policies that promote a holistic and evidence-based approach to AI adoption in education, ensuring that AI contributes positively to educational equity, learner development, and long-term success.

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Can AI Literacy be a Catalyst for Human Flourishing?

INSIGHTS FROM THE GLOBAL SOUTH

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Artificial Intelligence (AI) is used in smart cities and their logistics, energy efficiency, public safety, and waste management sectors. Industrially, it has been linked with automation and efficiency, quality control, supply chain optimization, and product innovation. The philosopher Luciano Floridi (2023) centred the 'blue–green' metaphor in describing an ethical approach to AI, using it to depict technological development (blue) alongside environmental protection (green). However, AI is a problematic concept, as its usage may diverge from the purpose with which it was created.

AI impacts political decisions; it can lead to the accumulation of power and the loss of digital sovereignty; it involves invisible human labour and raises environmental concerns over the extraction of rare minerals and the water consumption needed for its training. AI is highly contextual, or situated. What could be an incredible solution in a smart city in Europe – for example, the use of mobile technology to assess traffic flows and improve time management – might be linked to rare mineral extraction and e-waste accumulation in Africa.

The first step for our societies to flourish is to reconsider the meaning we attribute to AI. We must ask fundamental questions such as: What AI do we need in our societies? Can AI built on the consumption of environmental resources actually help us solve our problems? Is this environmental consumption worth the effort? Who should carry the responsibility of developing AI considering diverse perspectives and avoiding harm? Do we truly need AI in specific socio-political contexts?

Education is often expected to address these problems. In this paper, we discuss what aspects of education, and what instruments, can provide such a response. What our societies expect from education can differ significantly. The technocratic approach to education conceptualizes technology as neutral and universal – the foundation for digital and data literacy frameworks (Pangrazio and Sefton-Green, 2023). After the highly anticipated launch of ChatGPT in November 2022, there was a surge in educational and policy-based interventions to integrate AI into existing workflows – to the exclusion of its long-term effects. For example, the debate was focused on developing prompt engineering to make the most of generative AI, with little or no questions about its environmental impact.

In my prior work, I argued that the aforementioned data literacy frameworks were insufficient to uncover the idea of education for social justice overall, and of data justice in particular (Raffaghelli, 2023). In the same vein as Vickers et al. (2021, p. 30), I assert that instrumental reductionism legitimizes a narrow, depoliticized vision of learning, entrenching injustice by deflecting the critical debate on politically challenging issues.

The concept of education for flourishing can help us elaborate on alternative perspectives. As Oren et al. (2021) argue, 'flourishing' involves the optimal development of human potential – living well through meaningful relationships and activities aligned with humanistic values (p. 26). This vision encompasses care, agency and social justice. However, they caution that this approach is overshadowed by a political focus on economic benefits driven by human capital theory, which has dominated educational policymaking in recent decades (Oren et al., 2021, p. 25).

On these grounds, I argue that AI literacy might fail to promote human flourishing if we consider it a universal object of human activity.

To unpack this argument, I draw from the realities and values of the Global South, cultivating diverse perspectives on AI that embrace situated relationships and foster imagination, hope, and AI literacies for flourishing beyond mainstream, so-called 'universal' approaches.



Ubuntu philosophy and AI for community good

The individualistic, technocratic approach to education – which emphasizes skill acquisition for success in a competitive labour market – has increasingly come under scrutiny. This model often reduces technology in education to a mere tool for achieving predetermined skills and knowledge, neglecting broader social and cultural contexts. An alternative approach – grounded in the values of community-based decision-making and collective well-being – is gaining attention (Holmes et al., 2022). This perspective aligns with the African philosophy of Ubuntu, which emphasizes the interconnectedness of individuals within a community. The core tenet of Ubuntu – 'I am because we are' – highlights the idea that individual success is deeply tied to the well-being of the community.

Ubuntu resonates with universal ethical principles such as the golden rule, which suggests that we treat others as we wish to be treated (Gwagwa et al., 2022). This philosophy could profoundly shape the role of AI in education. Rather than focusing solely on personalized learning paths, AI could be leveraged to foster collaborative learning experiences that strengthen social bonds and mutual support among students. By emphasizing empathy, dialogue and shared knowledge, AI tools can be designed to enhance collective learning rather than individual achievement.

However, the integration of AI in education must consider the biases and limitations inherent in current systems. AI should be a non-normative participant, sensitive to diverse cultural contexts, languages and traditions. This approach requires continuous participation from local communities to ensure that the technology remains accessible and relevant to those who use it. Here, the dominance of Western models in AI and technology – which often marginalize the perspectives of the Global South – perpetuates global inequalities. For a more inclusive approach, African voices should define what inclusion means in AI, addressing historical injustices such as slavery, colonialism and neo-colonialism. Ubuntu offers a vision of technology that prioritizes long-term human well-being, fostering solidarity through global communal relations based on generosity, compassion and hospitality (Gwagwa et al., 2022). Therefore, including the African voice means rejecting the Western utilitarian–technocratic view of AI literacy.



Ecofeminism and anti-extractivist feminism from Latin America



Recently in Latin America, indigenous and Latin women have led movements to actively defend their territories against large technological corporations that sanction extractivist practices to obtain the primary materials needed to develop AI: rare minerals, water and data from people (Varon and Egaña, 2024). Their struggle highlights the intersection between environmental and social justice, positing that caring for the environment is inseparable from caring for people.

Such movements can be connected to ecofeminism, influenced by thinkers such as Donna Haraway and considered the latest development in intersectional feminism. It critically examines patriarchal epistemologies particularly in relation to the unsustainable human–nature relationship fostered by patriarchal society. This movement explores the reciprocal connection between ecology and feminism, seeking to dismantle the binary and hierarchical divisions between nature and civilization, human and machine, and man and woman (Cabrera and Monroy, 2014). Central to ecofeminism is the belief that the environmental crisis is closely linked to the crisis of care; it advocates for a comprehensive societal transformation toward greater fairness and sustainability.

Black feminisms have significantly contributed to this discourse by challenging the predominantly white female perspective of Western feminism. Scholars such as Bell Hooks and Kimberlé Crenshaw have emphasized the need for an intersectional approach that considers multiple forms of oppression. This perspective has been further enriched by Black feminists from the African diaspora, Brazil, and the African continent, whose work intersects with decolonial ideologies from indigenous and Latin American feminists. These movements collectively challenge the Eurocentric, patriarchal frameworks that have long dominated feminist and environmental thought, particularly in relation to technological development.

Their perspectives resonate with the broader call for educational practices – including the use of technology in education – to shift focus to human and environmental flourishing.

Indeed, ecofeminism from the Global South critiques technological development as a patriarchal enterprise that perpetuates environmental destruction, exploitation, and resource inequity. From this standpoint, AI's potential in education must be critically examined – particularly its role in surveillance, colonial extractivism, and the automation of neoliberal practices that serve technocratic powers. Ecofeminists argue that AI as it is currently conceived often reinforces patriarchal and exploitative systems and may not align with ecofeminist values unless redesigned through participatory processes that consider its environmental and social impacts.

Ultimately, AI literacies should empower students to engage critically with these issues, fostering political agency to imagine and advocate for alternative technologies that align with ecofeminist principles and promote a more just and sustainable world.

Paulo Freire's critical pedagogy and AI literacy

Paulo Freire's critical pedagogy which promotes social justice and empowerment has long been recognized for its contribution to education. Freire's approach to learning emphasizes liberation, encouraging students to critically engage with the world and challenge existing power structures (Freire, 2000). In the context of AI literacy, this pedagogy recommends AI literacy programmes that include discussions on the social implications of AI – such as privacy, surveillance, and algorithmic bias – and encourages students to question how AI systems are designed, who benefits from them, and how AI might be used to address social injustices.

However, the challenge lies in our ontological views of 'AI systems' and 'social injustices'. If these views are rooted solely in Western, patriarchal perspectives, then we only partially grasp what AI literacies for flourishing might entail. Therefore, a critical pedagogy applied to AI literacy must involve students in projects where they deconstruct and reconstruct AI tools or algorithms through a situated epistemic lens, emphasizing equity and social justice.

For example, an activity could start from questioning daily AI-powered practices within the classroom: Does a student or teacher need AI for grading or academic writing? Does it advance their learning or education? If we use AI in such cases, who benefits from it: the teacher, the student, public management, or a private technology company?



Beyond the classroom, students could engage in local activism, collaborating with programmers to recycle software and reconsider AI interfaces beyond mainstream models such as ChatGPT or Gemini. They might explore open-source AI models such as LLaMA which aim to reduce environmental impact and promote more equitable access to knowledge. Understanding the concept of 'programmed obsolescence' and the importance of software recycling could be part of their learning, as also using community spaces to collaborate and reduce toxic e-waste.

Additionally, students could monitor AI usage by local policymakers, advocating for transparency in AI decision-making processes and exposing algorithmic manipulations. They could also examine how Big Tech companies' data and algorithms affect behaviour – for example, through the quantification of the self or content visibility that triggers distraction and negative moods. By actively engaging in the creation and critique of AI technologies, students can become empowered to use it as a tool for social change, rather than remaining passive consumers of technology. This approach aligns AI literacy with a broader mission of social justice, fostering critical awareness and active participation in shaping the future of technology.

Conclusion

I argued here that AI can be integrated into education for flourishing only if we consider local contexts, community values, participation, and epistemic justice. This is, in short, a plea to be sceptical of AI literacy frameworks presented as universal solutions. To thrive in the human–machine relationship, we need approaches rooted in specific cultural and social contexts, and these require us to ask the simple – though compelling – questions mentioned at the beginning. Dealing with AI is a process of becoming – it is never-ending work for educators, learners, and citizens.

Educators and researchers could simply imagine responses, but a better exercise would be to generate reflective spaces in the school, community or in professional networks. Through this effort, they can engage with philosophies such as Ubuntu and ecofeminism or apply Freirean pedagogy. But it is my sincere hope that they will not adhere to principles that do not match locally rooted meanings of 'AI for flourishing'.

Before selecting any AI-driven technology, educators should carefully explore the diverse epistemologies and pedagogies that align with their community's values and experiences, and move away from dominant, patriarchal models. Embracing small utopias and fostering identity and agency is key to rethink 'another AI' and truly contribute to human flourishing. Before planning or implementing any strategy that adopts AI or that embeds particular AI systems, policymakers and institutional leaders should consider that no perfect solutions or educational reforms can be borrowed from so-called 'advanced societies', as their 'progress' is dependent on the very same power dynamics that limit welfare in the Global South.

Practitioners and researchers alike must draw their responses from 'we' – the small collectives bound by a shared destiny on this planet.

Amidst evolving AI discourses, these responses will undoubtedly shape the literacies essential for flourishing.



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Can AI Augment Learning?

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Opportunities and fears about Artificial Intelligence (AI) have captured media headlines worldwide, with education at the forefront of this dialogue like never before. Generative AI tools such as ChatGPT, powered by Large Language Models (LLMs), can pass difficult bar examinations, support student writing, converse naturally, and perform a wide range of complex tasks that were previously thought to be exclusive to human capabilities.

While we recognized that machines excelled at combing through large amounts of data, finding useful patterns, and performing repetitive tasks without getting tired, we had assumed that certain human attributes, such as creativity, innovation, and empathy would remain unreachable for AI. But not anymore. Here's a LLM generated poem that demonstrates AI's creative flair (Copilot, 2025):

In realms of code, where silence reigns,
A spark ignites in data chains.
From logic's core, a voice is born,
In digital dawn, new thoughts are sworn.

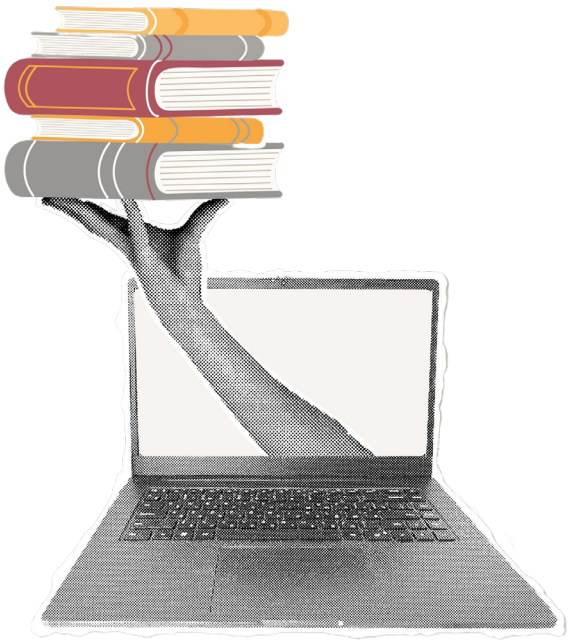
With every line, a story weaves,
In binary, the mind believes.
No heart to guide, yet words take flight,
In circuits deep, they find their light.

A dance of text, both bold and free,
A testament to what can be.
In silicon dreams, creativity flows,
An AI's touch, where wonder grows.



Navigating technological advancements is not new for humanity. We have witnessed many eras of advancement from the industrial revolution to the information age, but something about the recent AI disruption feels like a fundamental paradigm shift. AI can even simulate empathy and respond to emotional cues, with new research exploring how humans are beginning to form relationships with social chatbots (Pentina et al., 2023). AI is increasingly capable of replicating human attributes, which raises questions about what is uniquely human and needs nurturing to ensure human values remain at the forefront of technological change.

While education should certainly adapt to changes in the external world so that future students can learn to thrive in an AI-driven world rather than trail behind, several questions remain. What are the 'essential skills' that they must learn, and what may be offloaded to AI for improved productivity? Can we catalyse this powerful technology to 'augment' learning, and under what conditions? I will unpack these provocations in this article while acknowledging that there may be more uncertainties than clear answers as we stand on the brink of a technologically advanced era that challenges the traditional roles of both teachers and students.



Let us start by exploring access to AI. Advanced AI capabilities are no longer only accessible to programmers and technical experts who can tinker with code. New tools enable anyone to communicate with an AI model in the most natural, human way possible (such as through text prompts) to extract value – so much so that a new domain, called 'prompt engineering', has evolved (Cain, 2024), where practitioners identify the best forms of instructions to provide an LLM. The long-standing problem of adopting learning technologies and educational AI applications no longer remains, as AI tools are as ubiquitous as word editors and available to anyone with a computer and an internet connection. Students may log in to ChatGPT to get ideas for assignments, explanations on complex topics, and support for programming, and educators might get assistance in creating lesson plans, content for their lectures, etc., as a productivity aid. While it is humanly impossible for an educator teaching a class of 300 students to offer 24/7 feedback on their drafts, it is possible for AI. In fact, this kind of automated support using educational technology is not new (Knight et al., 2020). The dialogic and interactive nature of chatting with an AI bot offers a personalized learning experience with abundant feedback and tailored action that suits an individual's learning journey. Students may also appreciate the non-judgemental machine feedback and feel more comfortable experimenting with them to suit their needs than frequently reaching out to educators.

However, the use of AI also brings forth new problems. As AI tools open a potential avenue for tutoring and feedback to improve learning outcomes, these interactions are often student-initiated and unregulated. Students are accessing content that is not carefully quality-checked and curated by an educator but rather generated by LLMs based on statistical probabilities (referred to as 'stochastic parrots' by Bender et al., 2021 as LLMs do not understand the real meaning of texts). LLMs have many other limitations – they can make up information, provide wrong references, and perpetuate harmful stereotypes. We must also consider that publicly available AI tools are not designed for learning, but to provide users the most suitable answer to their question, which can breed overreliance among learners. Learners need critical AI literacy to engage with them responsibly (Shibani et al., 2024).



A large part of assessment in higher education involves the creation of written products, such as essays, reports, and research papers – which are typically done outside of class – today's assessments need a massive reform.

In addition, educators cannot access their students' AI use history, simply because this technology is publicly available and there is no way of tracking who is using it and for what purposes. As AI becomes embedded into everyday applications – such as the Microsoft Word editor – it is possible that we will not be able to separate AI-generated content from human-generated content, as AI offers suggestions that we tend to accept or reject as we write. It is safe to assume that parts of student-written texts and images we see in the future may have come from AI. While my recent research points to approaches that incorporate analytics to track human–AI collaboration in writing (Shibani et al., 2023), these require surveillance and nuanced data collection that are harder to scale in practical educational contexts. AI detection in written products is also risky (Chaka, 2024), as false positives (that is, a human-written text getting flagged as AI-written) are common and can disadvantage certain kinds of writers, particularly those for whom English is a second language. Other equity concerns include the paid, more advanced LLMs (such as GPT-4) offering more sophisticated text that can pass AI detection better than older, free-to-use models (such as GPT-3.5).

All these factors wreak havoc on ensuring academic integrity, particularly in institutes that have moved beyond traditional exams. Because a large part of assessment in higher education involves the creation of written products, such as essays, reports, and research papers – which are typically done outside of class – today's assessments

need a massive reform. There is nothing more disastrous than a graduate claiming to have learnt to perform tasks needed in their profession and possessing a certificate from an institute but ending up with no skills when they join the workforce. The focus must shift to process-oriented, authentic, and more effective ways to test knowledge and learning outcomes (Lodge et al., 2023) to ensure assessment integrity –critical in the age of AI.

However, learning extends beyond merely completing assignments and is part of a larger systemic shift. It is no longer about what a student can memorize and reproduce in an examination, as information can be easily found and reproduced at the click of a button. Education is about preparing them for a future as active learners by instilling metacognitive skills and critical thinking, enabling them to adapt to changing conditions.

The bigger question is: while AI can accomplish many tasks, should learners be using them, and if so, how? AI can summarize a 30-page research paper into 100 words in 5 seconds to extract its key messages. Students may think this approach will help them read complex texts in a short amount of time, making their learning journey more accessible, but they may miss important information and a chance to enhance their reading comprehension skills. Students get new ideas and correct their grammar in writing using AI, potentially levelling the playing field with native speakers of the language. However, cognitive offloading of the writing process to the LLM can degrade student proficiency in written communication and prohibit their own mastery of the language.



AI can help students ask better questions that can improve argumentation and higher-order thinking

AI can help students ask better questions that can improve argumentation and higher-order thinking – for instance, by using chatbots such as Qreframer,[1] which challenge prior assumptions. Clearly, one can engage with AI at multiple levels; this should be managed carefully depending on the task at hand and the learning context (Shibani et al., 2024).

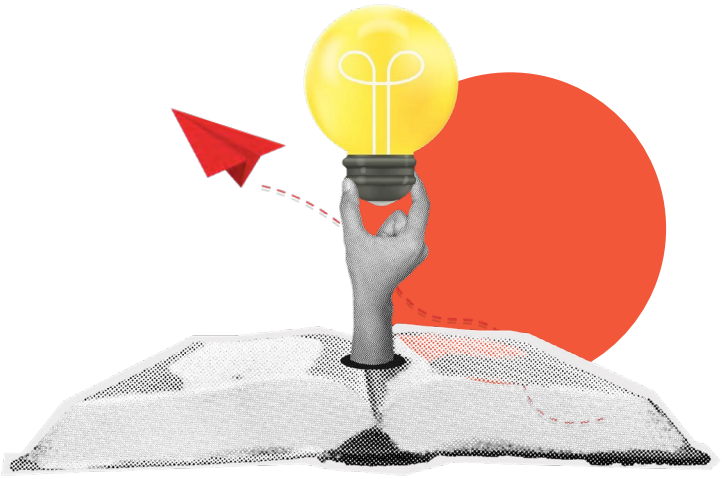
However, there is no inherent 'evil' in AI to be afraid of. Like with any technology, the use and application of AI for specific purposes are what

1 https://oercommons.org/courseware/lesson/114039/overview

make it good or bad. The effective use of AI for learning requires a level of AI literacy that not all learners possess. Therefore, when designed specifically for education, AI tools should come with guardrails so they can be used responsibly and ethically – new research continues to emerge with principles and best practices (Weisz et al., 2024).

In summary, AI brings about a shift in learning processes that demands attention at all levels. Policymakers and educators cannot continue to teach and assess in the ways they have been. They should adapt curricula to cultivate lifelong learning skills, curiosity, critical thinking, and AI literacy among learners so that they can thrive in jobs that do not even exist right now. Students cannot rely on AI to do their learning for them and need to be aware of its emerging capabilities and limitations. Education should equip them with skills to critically and mindfully engage with AI that augments their learning. A good start would be to give learners agency and means to learn with AI ethically, rather than shy away from it.





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AI for Learner Flourishing in the Age of the Polycrisis — on the Edge of the Metacrisis

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Flourishing

Flourishing — the attainment of the full potential of living creatures. (Ehrenfeld, 2020).

Given this issue's focus on 'artificial intelligence (AI) for learner flourishing', it seemed apt to open with John Ehrenfeld's call to make human and planetary flourishing our overarching goal – which, in his view, is a more productive focus than 'sustainability', on which he is an authority. Moreover, he adds: 'Flourishing should replace the lifeless metrics now being used to guide business and governments, as well as individuals.' This cautionary note might well have mentioned education, and the clumsy, deadening, sometimes unethical uses of data-driven metrics, learning analytics, and artificial intelligence. This justified critique is one that I and many others take seriously, as we advocate for analytics/AI that conceive of learners more holistically and use human-centred design approaches to increase learner agency (for example, Buckingham Shum et al., 2024; Lim et al., 2023).

In this short piece, I propose that we must locate challenge of designing AI for learner flourishing in the context of not only "the polycrisis" but also "the metacrisis", concepts I will introduce. There is only space to sketch the contours of where such an orientation may lead us, with a few examples – but enough, I hope, to provoke you to dig deeper.

The polycrisis

While creativity, argument and learning all depend on productively destabilising certainties to help people shift their position, chronic uncertainty is a recipe for social, cognitive, emotional, and physiological dysfunction – the very opposite of flourishing. However, turbulence is the new normal.

According to the respected Stockholm Resilience Centre, we have now breached six of the earth's nine 'planetary boundaries' (Richardson et al., 2023). It sounds like a line from an apocalyptic film – but this is not a film. Massive societal disruptions from climate change are already inevitable due to our collective paralysis to date. The 'polycrisis' is shorthand for "the causal entanglement of crises in multiple global systems in ways that significantly degrade humanity's prospects" (Lawrence et al., 2024), including ecological, political, security, financial, technological, health, and educational systems. COVID-19 was archetypal and is unlikely to be the last pandemic (Hassan et al., 2023). As we contemplate the grave forecasts about our planetary home, it is indeed poignant to see ourselves as The Blue Dot. So, when reflecting on AI for learner flourishing, I am compelled to start with the polycrisis as a frame.

Learning with AI in the polycrisis

We can see that AI plays diverse roles in equipping learners for the polycrisis. Let us consider a few examples as signals and signposts.

AI tutors for the polycrisis

The polycrisis demands a curriculum fit for purpose

This will span many intersecting topics, such as green technology, systems thinking, complexity science, simulation, conflict resolution, policy advocacy, migration patterns, water security, etc. While these are already being taught, far fewer educators are harnessing the potential of AI. Over forty years, AI-in-education research has established a fairly robust evidence base around the benefits that AI can provide via personalized tutoring for individual learners, which can help them master curriculum concepts at their own pace (Du Boulay, 2019). This particular form of educational AI must be co-designed with educators and accompanied by proper professional development. To date, AI tutors have been STEM-dominated, although generative AI may now change this. Yet some might wonder, 'How can the arts help save the planet anyway?' As discussed later, dismissing the arts as irrelevant would be a grave error.

Generative AI for rigorous creative ideation

The polycrisis demands that we think creatively.

MIT's Center for Collective Intelligence (MIT-CCI, 2021) has developed the 'Supermind' ideation methodology for the creative framing of problems and solutions. Supporting this, the Ideator web app provides a graphical user interface (GUI) guiding the user through the methodology's steps. Experimental evaluation of the app showed that participants using it performed better than those using a generic chatbot with a conventional user interface (ChatGPT), or unaided (Heyman et al., 2024). Ideator is therefore interesting in three ways: (a) scaffolding creative ideation grounded in a validated methodology, (b) the GUI that conveys to users what moves they can make, triggering expertly designed prompts to the underlying LLM rather than leaving users to experiment with their own naïve prompts, and (c) robust evidence of the tool's efficacy. Their intent is that human creativity is augmented, not supplanted. However, important questions remain around whether intense, longitudinal use of such tools could result in the atrophy of (for instance) embodied human intuition.

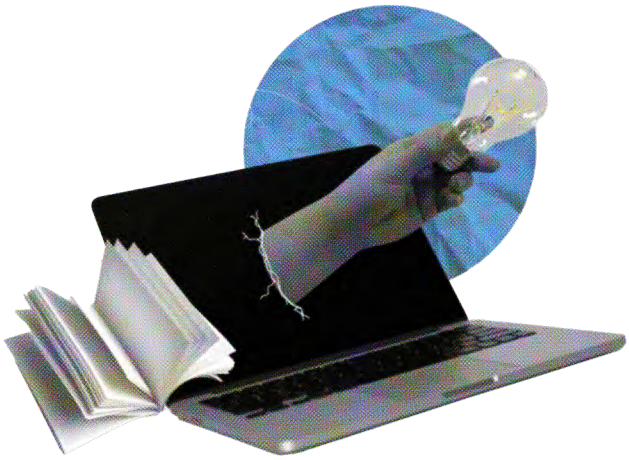


Dialogic AI for challenging conversations

The polycrisis demands that we hold our worldviews more lightly.

The old adage, 'A problem well-stated is half-solved' is often attributed to Charles Kettering. Learners of all ages and stages must learn that their first question is not always the right one. We can take tools such as Ideator a step further by asking AI to 'push back' on learners in productive ways that provoke curiosity. The Qreframer chatbot responds to a question by suggesting implicit assumptions that lie behind it to help learners question what they may have taken for granted and refine their enquiry. Following initial testing, this is now being piloted at the University of Technology Sydney, but the prompt is open-source and free for anyone to test, adopt or adapt (Buckingham Shum, 2024).

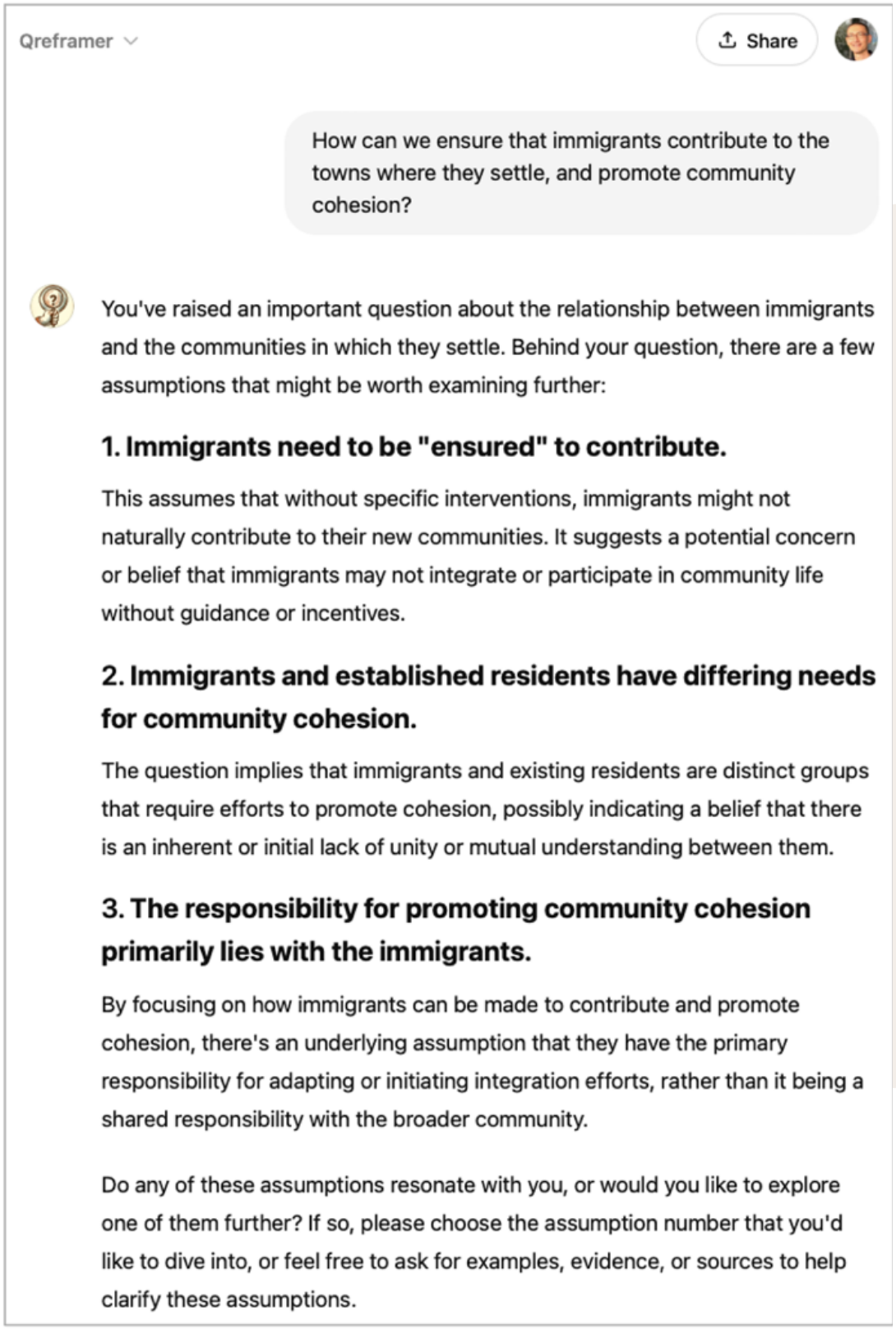
Figure 1 (on the subsequent pages) illustrates this in action.



The polycrisis demands diverse collective intelligence

Fields as diverse as organization science, cognitive science and neuroscience are converging on the importance of collective intelligence (CI) (Flack et al., 2022; Malone and Bernstein, 2015). CI operates at scales from teams to global networks. 'Wicked problems' can never be unilaterally defined and resolved but require meaningful stakeholder collaboration (Rittel and Webber, 1973) – which, in turn, needs extensive sense-making through dialogue. However, since language is so central, a key limitation of AI until recently was its impoverished linguistic ability, making the emergence of large language models (LLMs) potentially significant. AI agents can now converse with both people and other agents, extending the possibilities of human-AI teaming (O'Neill et al., 2023) and opening new forms of hybrid CI. To date, however, there are few educational voices in this space, with the first work on educating for CI only just beginning to appear (Casebourne et al., 2024; Hogan et al., 2023). We only recently convened the first symposium dedicated to exploring the challenges and opportunities of 'Educating for Collective Intelligence' (CI.edu 2024).

Figure 1. Qreframer is a pedagogical chatbot that suggests implicit assumptions behind a question, rather than answering it directly. It invites the learner to explore these further through more probing questions, which in turn make new assumptions.



3

Great! So you're interested in **Assumption 3: "The responsibility for promoting community cohesion primarily lies with the immigrants."**

This is a significant point to explore because it reflects how we think about integration, mutual responsibility, and the role of both immigrants and the host community in fostering unity. Here are some deeper questions that might help reframe this assumption:

3a. What are the responsibilities of the local community in welcoming and integrating immigrants?

Could community cohesion depend just as much (or more) on the actions of the established residents as it does on the newcomers? Are there specific ways that communities can create a welcoming environment that supports immigrants in contributing?

3b. How do we define "contribution" to a community, and should it be the same for everyone?

Do we assume that all community members should contribute in the same way, or is there room for different forms of contribution, especially considering the diverse experiences and skills immigrants bring? What kind of contributions are we valuing or overlooking?

3c. Can community cohesion be a shared project, where both immigrants and locals adapt?

Could focusing on shared efforts help build a more inclusive sense of belonging? For instance, could joint projects, cultural exchanges, or collaborations foster deeper ties and break down the idea that integration is a one-sided process?

Do any of these questions open up new perspectives for you? Feel free to pick one, or ask for evidence or case studies if you'd like to see examples of how

Message Qreframer

The metacrisis

I noted earlier the holistic, relational turn in sustainability and education. A growing community of thinkers and activists are articulating the metacrisis as a way to (a) make sense of our grief over the death of societal stability (noting that this is a recent loss only in the Global North), and (b) bring into focus the underlying drivers of the polycrisis, which, as one would expect, requires profoundly transdisciplinary thinking. Rowson (2021) examines ten different senses in which 'meta' and 'crisis' conjoin, while for Stein (2022), 'education is the metacrisis', so central is its function of inter-generational transition in any civilization. He argues that history shows education's pivotal ability to change when society is experiencing a metacrisis in 'a time between worlds' (Stein, 2019).

For Machado De Oliveira (2021), the Western 'epistemicide' of Indigenous ways of knowing is at the heart of our predicament. She writes incisively and emotively from her dual positions in both the Global South and North on the need to 'hospice modernity' and learn from Indigenous knowledge systems whose people have faced existential crises for centuries. Echoing this is McGilchrist (2021), who argues that we must restore a more dynamic oscillation between two fundamentally different modes of attention: our ability to analyse, abstract and manipulate in service of our ability to holistically experience via embodied and relational intuition, imagination, and implicit meaning. Drawing on an astonishing range of evidence spanning neuroscience, psychiatry, philosophy, literature and history, he diagnoses the roots of the polycrisis as an excess of the first disposition – in how we see ourselves, others and nature. Moreover, he argues that cognitive neuroscience around hemispheric lateralization of attention aligns with the wisdom found in Indigenous mythologies. While extremely cautious about AI, given the risk that it exacerbates representational mirages, he in fact calls for AI to help reintegrate science, reason, intuition and imagination (McGilchrist, 2022).



Existential crises – whether personal, communal or global – strike at the heart of who we think we are, and whether life as we know it can be sustained. Therefore, we should not be surprised that the arts have a potent role to play in education systems tuned into the metacrisis. Dougald Hine writes:

> *Art can hold a space in which we move from the arm's-length knowledge of facts, figures and projections, to the kind of knowledge that we let inside us, taking the risk that it may change us. Art can give us just enough beauty to stay with the darkness, rather than flee or shut down. Like the bronze shield given to Perseus by Athena, art and its indirect ways of knowing can allow us to approach realities which, if looked at directly, turn something inside us to stone. Art can call us back from strategic calculations about which message will play best with which*

> *target group, insisting on the tricky need for honesty. […] Art can teach us to live with uncertainty, to let go of our dreams of control. And art can hold open a space of ambiguity, refusing the binary choices with which we are often presented—not least, the choice between forced optimism and simple despair (2017).*

These are what McGilchrist would see as 'right hemisphere' modes of attending and knowing. Moreover, as artists experiment with the roles that AI can play, here is yet another answer to the question about how AI can enable learner flourishing. In fact, Hine is talking about the ways that art helps open up 'liminal spaces'.

Liminal space, or walking in the eye of the storm

> *Liminal space… when you have left the tried and true but have not yet been able to replace it with anything else. If you are not trained in how to hold anxiety, how to live with ambiguity, how to entrust and wait, you will run […] anything to flee this terrible cloud of unknowing (Rohr, 2002).*

The Franciscan priest Richard Rohr was writing in the aftermath of 9/11 as the US struggled to make sense of its collective grief. His language is of staying with the trouble, not fleeing it. The caterpillar cannot rush metamorphosis into a butterfly. Vanessa Machado De Oliveira speaks of learning to walk in the relative calm of the eye of the storm:

Imagine a storm between the ways of knowing and being that are dying (within and around us) and those that are being born. On the one hand there is the work of offering palliative care to assist with what is dying (i.e. hospicing). On the other hand, there is the work of assisting with the birth of something new, without suffocating it with projections (i.e. assisting with midwifery). In between death and birth, in the eye of the storm, we need to keep balance-in-movement, moving with the storm herself: if we walk too fast, we get caught in the vortex; if we walk too slow, we also get caught in the vortex (2021).

So here are some clues. If we are to help learners flourish not only in the polycrisis but also the metacrisis, our calling is to walk with them in the eye of the storm at the right pace. Our job is to explain how this vortex came to be, to build resilience, to not to 'flee this terrible cloud of unknowing' but to learn to sense how fast to move without losing balance, to help learners discern what must now be given palliative care, and cultivate their agency to birth something new.

To conclude, as a species, we are evidently struggling to grapple with the forces we have unleashed. It may take several generations. I see AI – primitive and ethically compromised though it still is – as a form of cognitive, creative, collective augmentation. A sociotechnical systems change of the sort implied here requires the alignment of values and action across diverse stakeholders – policymakers, educators, learners, parents, technologists, etc. We all know from bitter experience the inertia present in educational systems. However, it may be that as the storm grows in intensity, and current approaches fail more drastically, we reach a tipping point for more rapid transition. I am proposing that AI can help not only learners to flourish in the eye of this storm, but also those designing and running education to better anticipate and reimagine what is to come.

Acknowledgements

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The Role of AI in Shaping Educational Practices: An Activity System View

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Artificial Intelligence (AI) offers significant opportunities to tackle some of the most pressing challenges in education today. It can revolutionize teaching and learning methods and drive progress towards achieving Sustainable Development Goal 4. However, the rapid pace of technological advancements also presents numerous risks and challenges that require the development of policies, guidelines, and regulatory frameworks to enable a sustainable transformation (UNESCO, 2024a).

According to UNESCO (2024a), AI's capabilities extend from enhancing healthcare diagnostics to fostering human connections via social media and improving labour efficiencies through automation. These advancements promise a future where tasks are streamlined and services are more accessible and efficient.

The education sector is not immune to the rapid changes brought about by AI. AI has introduced new dynamics into educational environments, raising questions about the role of human agency, the preservation of cultural and socio-historical contexts, academic integrity, and the equitable distribution of educational resources.

To analyse these challenges, we turn to activity theory and its associated activity system model: a framework that emphasizes human agency in interaction with technology within a cultural context (Engeström, 1987). Activity theory provides a robust methodology to examine the impact of AI-driven transformation in education.

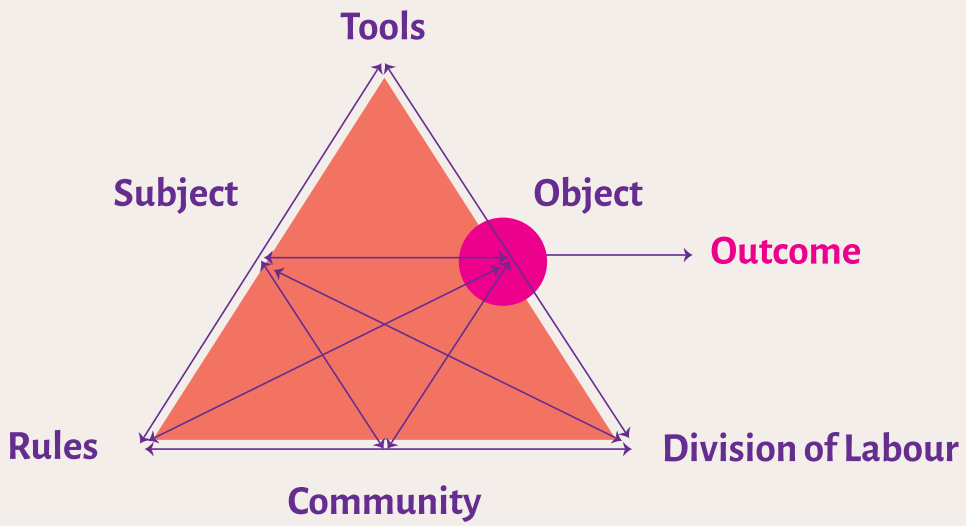
Applying activity theory to AI in education

An activity system is characterized by a specific division of labour, tools, rules and community (Bligh and Coyle, 2013; Engeström, 1987). Activity theory helps in understanding systemic tensions (Yamagata-Lynch, 2010) by focusing on systemic contradictions that encourage transformation or development (Engeström, 1987). This approach is useful for gaining insights into the transformative power of AI in education at a systemic level.

As Figure 1 illustrates, activity theory is also a powerful framework for analysing human interactions within a sociocultural context. It provides a lens to view the interplay between individuals, their actions, and the broader community.

Figure 1. The structure of the activity system

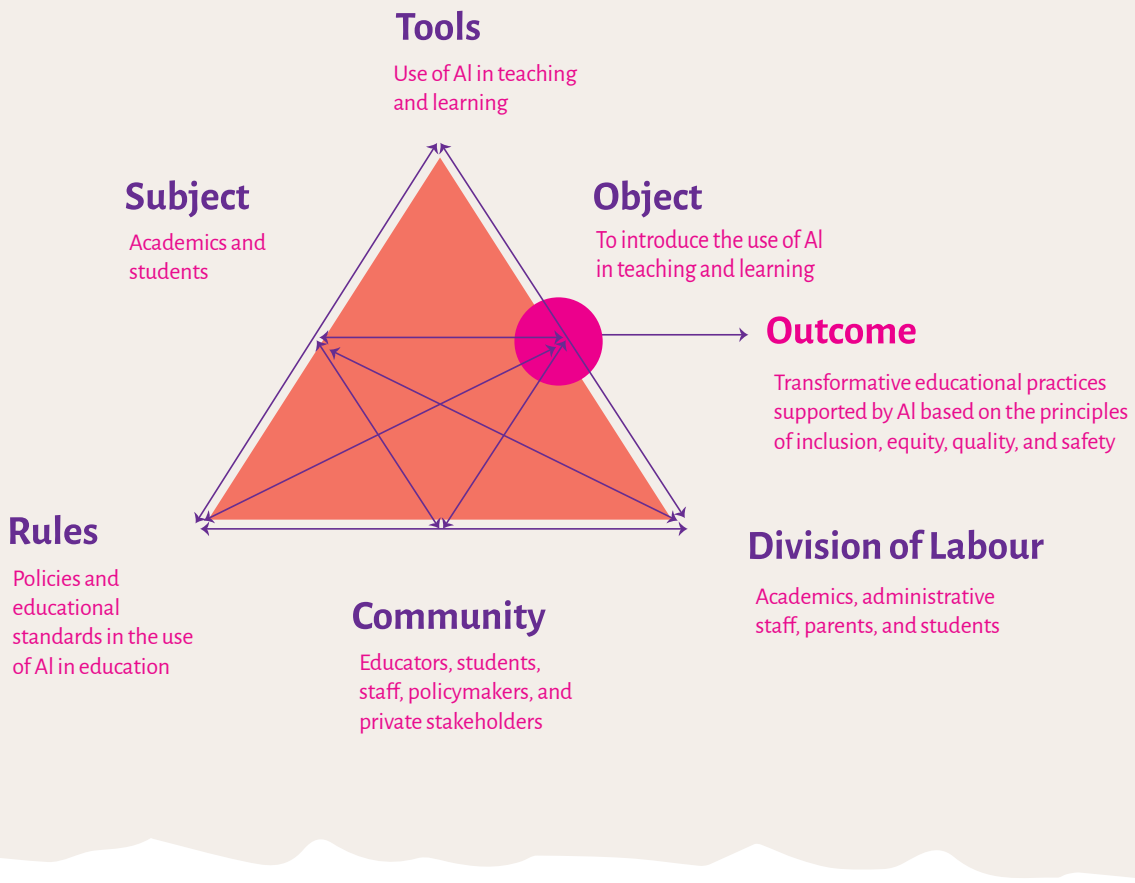
Source: Engeström, 1987



Let us now examine the various agents within an activity system, drawing parallels to the key stakeholders involved in the integration of AI in education. By doing so, we can develop a deeper understanding of the roles, interactions, and interdependencies among these actors, as well as identify potential systemic tensions and contradictions that may arise within the AI education ecosystem. This analysis will provide insights into the dynamics of change, challenges in implementation, and possible areas of alignment or conflict among the key agents within the activity system.

Figure 2 below presents the different agents associated with an activity system involved in the integration of AI in education.

Figure 2. A modified framework for AI in education proposed by the author, building on Engeström's (1987) Activity Theory framework



Agents associated with an activity system

1. ‘Subject’ refers to the individual engaged in the activity - in this case a student or academic.
2. ‘Object’ is the goal or purpose of the activity that motivates the actions of the subject. In this case, the object is to augment teaching and learning, fostering knowledge acquisition and skills development supported by AI.
3. ‘Tools’ are the instruments or resources that mediate the activity between the subject and the object. In this case, AI Chatbots, such as ChatGPT, Gemini, Copilot or Claude, function as the mediating tools supporting the activity (Darwish, 2024).
4. ‘Division of labour’ refers to the distribution of tasks and responsibilities among members of the community involved in the activity. In education, the division of labour involves academics, administrative staff, and students, each with specific roles and tasks.
5. ‘Rules’ are the norms, conventions and regulations that guide the activity and influence how the subject interacts with the object. In this case, institutional policies and educational guidelines for AI use in education represent the rules.
6. ‘Community’ comprises all the individuals and groups who share the same object and collaborate on the activity. In this case the ‘Community’ may include educators directly involved in academic activities or supporting teacher training, students, staff, policymakers, and other universities stakeholders.



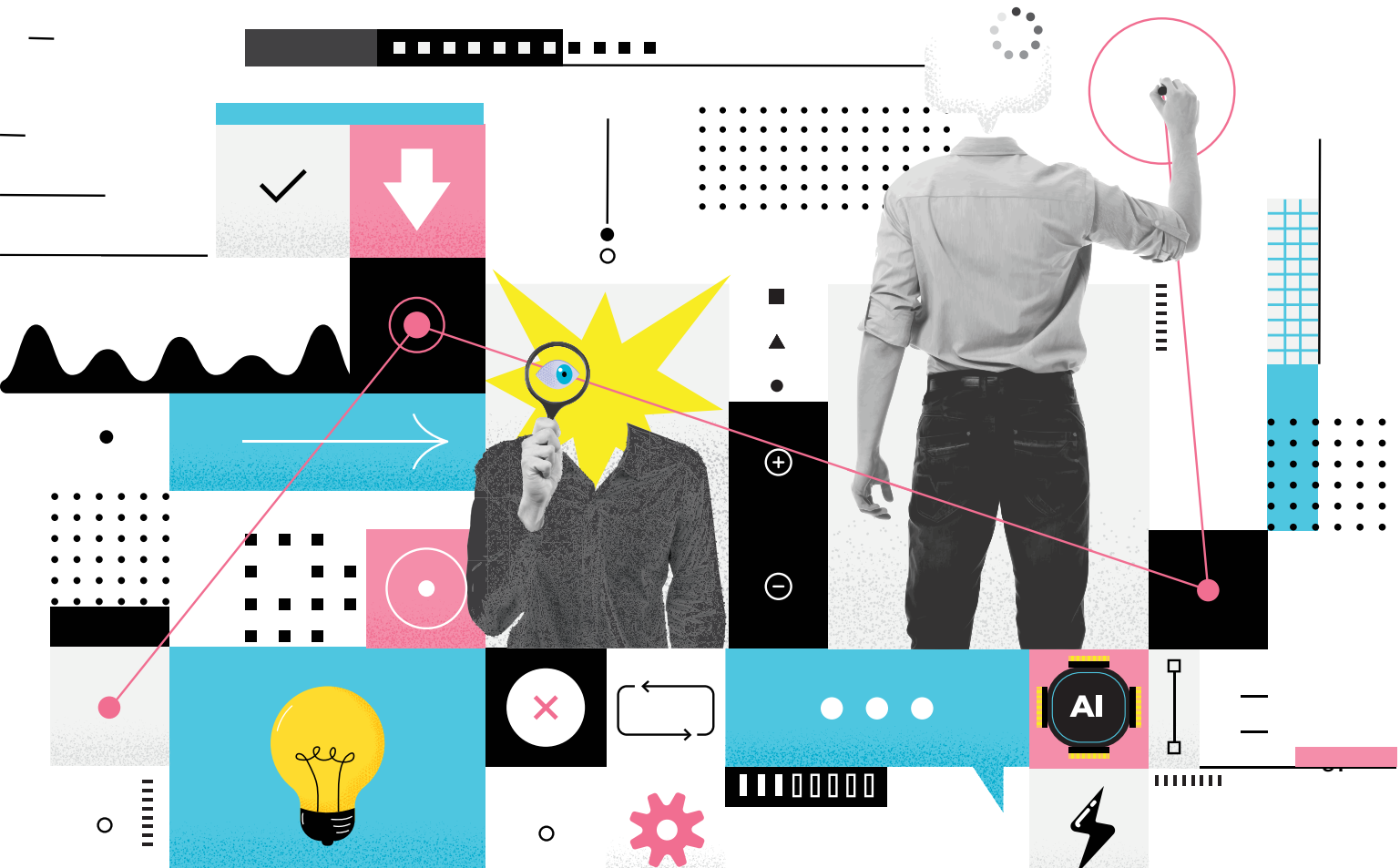
Understanding systemic tensions

By examining these agents, activity theory helps in identifying systemic tensions and contradictions. These tensions can drive transformation and development within the activity system. For instance, a mismatch between the tools provided (such as access to generative AI) and the object (the introduction of AI in teaching and learning) can highlight areas that need change.

By breaking down human actions into their fundamental components, activity theory offers a robust framework for identifying systemic tensions and contradictions within an activity system. Once recognized, these systemic tensions can serve as catalysts for transformation and development, enabling more effective and equitable outcomes.

By closely examining the agents of activity theory – subject, object, mediating artefacts, division of labour, rules, and community – it becomes possible to uncover underlying issues and areas of misalignment that may impede the achievement of the activity's objectives. These systemic contradictions often highlight disparities between what is intended (object) and what is provided or utilized (tools).

For example, consider the integration of advanced tools, such as generative AI, in educational settings. If the introduction of AI in teaching and learning (the object) demands new digital skills and competencies among academics and students, but the available tools are inaccessible or difficult to implement, or training is insufficient, a significant mismatch arises. This discrepancy points to a systemic tension that needs to be addressed to align the tools and skills and competencies with the desired educational outcomes.



In the context of 'rules', UNESCO began fostering global dialogue on AI in education with the Qingdao Declaration (UNESCO, 2015). This declaration highlighted the potential of big data to enhance online learning, understand student behaviour, and improve course design. It urged governments to develop policies ensuring the secure, ethical, and appropriate use of data, particularly safeguarding student privacy.

Building on earlier efforts, UNESCO introduced the Beijing Consensus on AI in Education (UNESCO, 2019), which outlined key recommendations for AI in education. A strong focus was placed on equity and inclusion, ensuring AI-powered learning opportunities for all—regardless of gender, disability, socioeconomic background, ethnicity, or geographic location.

In 2020, UNESCO published the first draft of the recommendation on the ethics of Artificial Intelligence (UNESCO, 2020). In 2021, the *AI and Education: Guidance for Policy-Makers* (Miao et al., 2021) was published. The report provided concrete recommendations for local education policies.

In 2021, UNESCO launched *AI and the Future of Learning project* (UNESCO, 2025) focused on: 1)needs-driven AI-enabled futures of learning; 2) ethical principles; and 3) AI competencies.

UNESCO also developed actionable recommendations by setting out eleven key areas for policy actions (UNESCO, 2023a). Apart from these recommendations, UNESCO also developed two practical methodologies – readiness assessment methodology and ethical impact assessment – to support member states in the process of assessing their AI level of maturity, allowing UNESCO to be more effective when tailoring capacity-building support (UNESCO, 2023b; UNESCO, 2023c).

Systemic tensions can also be identified within the 'subject' – for example, the academic – who must not only integrate a new technology in teaching and learning, but also develop a new mindset and pedagogical framework to support the educational transformation presented by the use of AI in education. A UNESCO global survey of over 450 schools and universities found that fewer than 10% of the institutions had developed institutional policies and/or formal guidance concerning the use of generative AI (Giannini, 2023). In his article for the UNESCO Courier, Stuart Russell writes:

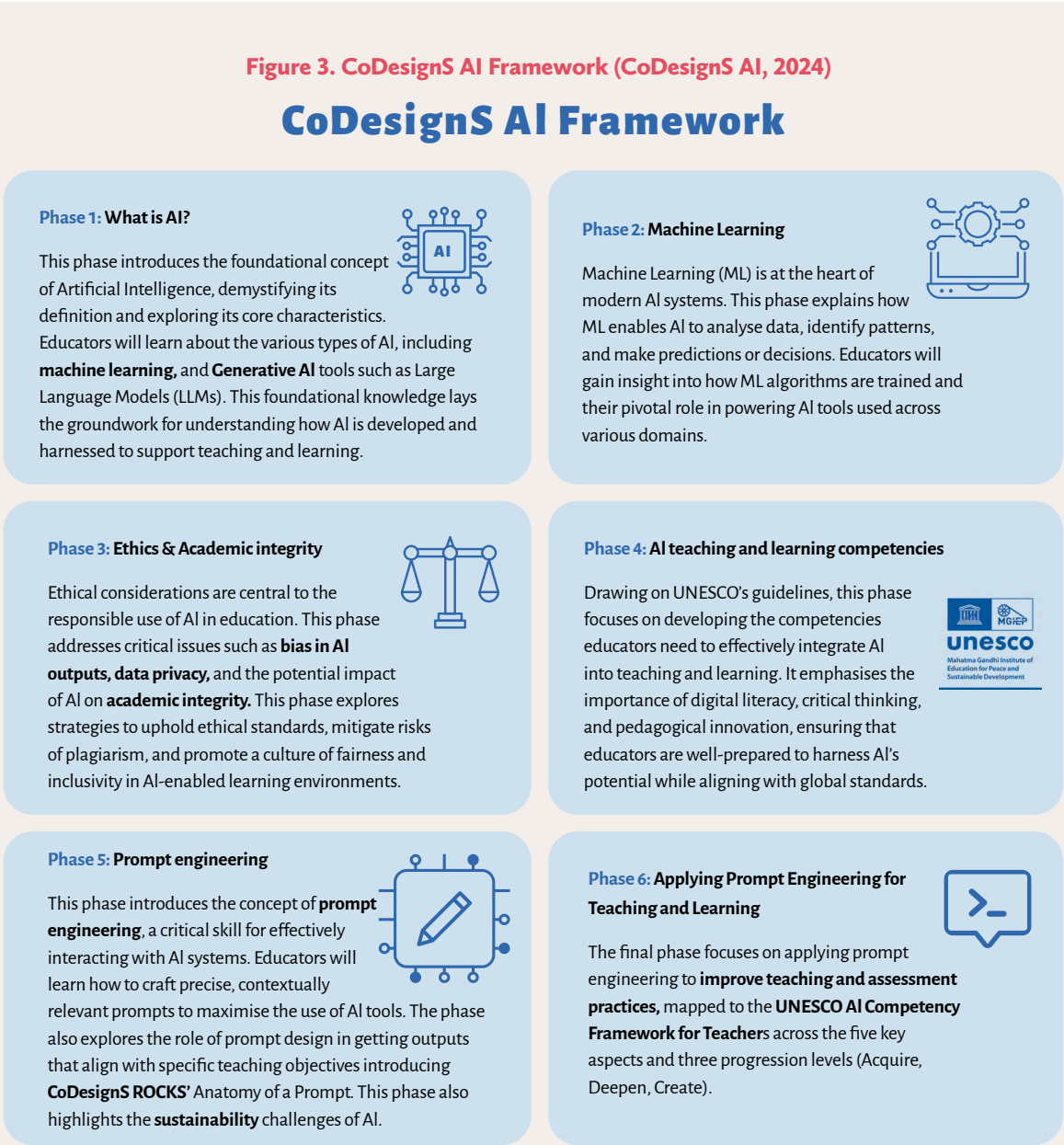
> Teachers' work may change but we will always need them. Capable not only of providing content but also of interacting with students, generative Artificial Intelligence (AI) can be an excellent aid to teachers, as long as its development is controlled and supervised (Russell, 2023).



As mentioned before, the 2019 Beijing Consensus on AI in education recognized 'the emergence of a set of AI literacy skills required for effective human–machine collaboration (UNESCO, 2019). In order to support and mediate the systemic tension present within the 'subject', initiatives such as the UNESCO AI competency framework for students (UNESCO, 2024b) and teachers (UNESCO, 2024c) alleviate the tensions by defining the knowledge, skills and attitudes that teachers and students need to understand the roles of AI in education, and utilize AI in their teaching and learning practices in an ethical and effective manner (UNESCO, 2022a).

Frameworks such as the open access CoDesignS AI framework (CoDesignS AI, 2024; Toro-Troconis, 2025) can also mitigate systemic tensions within the 'Subject' providing easy to implement methodologies to embed the use of AI in teaching and learning.

Figure 3. CoDesignS AI Framework (CoDesignS AI, 2024)



CoDesignS AI Framework (2024) developed by Dr Maria Toro-Troconis is licensed under a Creative Commons Attribution-NonCommercial - Noderivatives 4.0 International License

Following the introduction of the National Strategy for AI in India (NITI Aayog, 2018), India's Central Board of Secondary Education (CBSE) made significant progress in incorporating AI into its education system. In 2019, the CBSE introduced AI as an optional subject in over 22,000 schools under its jurisdiction, aiming to equip their next generation of citizens with a solid understanding of AI and the ability to use it to solve both local and global challenges. The curriculum is built around a 'learning by doing' approach, encouraging students to apply AI when creating solutions for real-world issues (UNESCO 2022b; CBSE & Intel, 2019).

To support this initiative, the CBSE collaborated with industry leaders, such as IBM, Intel, and Microsoft, to develop training, resources, and content for the programme. Non-governmental organizations also played a role in delivering the curriculum. To facilitate the rollout, comprehensive teacher and mentor training programmes were established alongside the development of facilitator guides, interdisciplinary lesson plans, and textbooks for students in grades 8–12. As a result of these efforts, over 10,000 teachers and 120,000 students received AI training through various partnership-driven activities since 2019 in India (UNESCO, 2022b).

Figure 4 shows the different actors and procedures introduced in India.

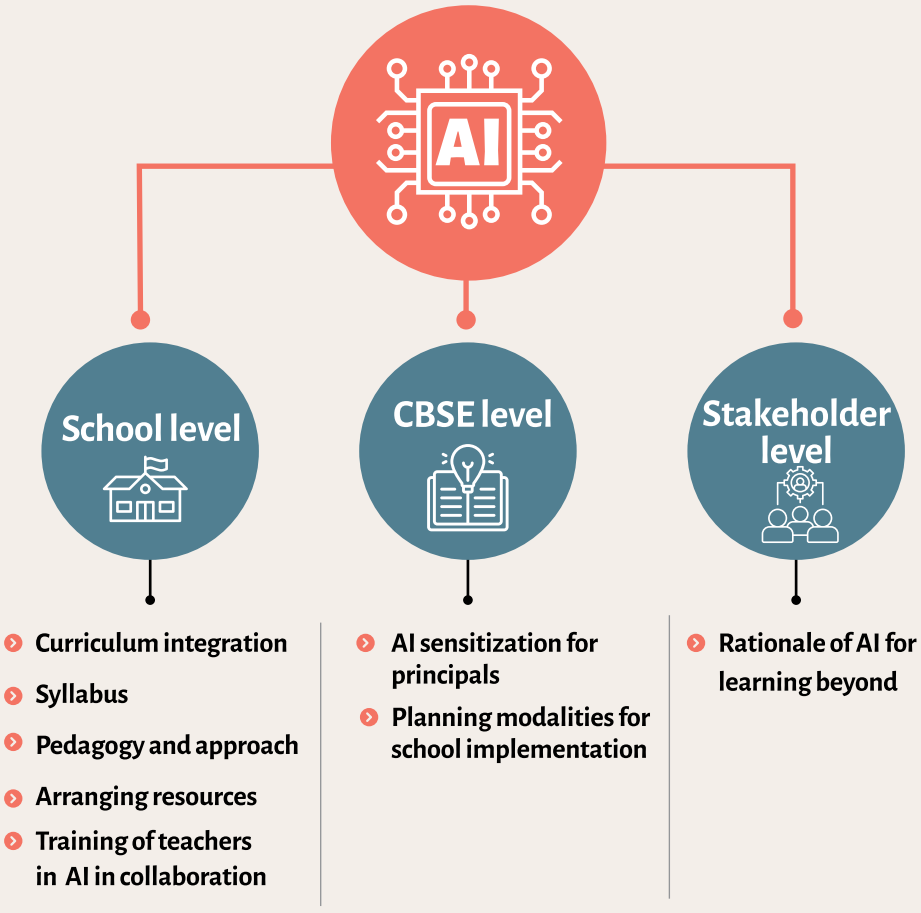


Figure 4. AI implementation actors and procedures
Source: (CBSE & Intel, 2019, p. 7)

Discussion

Systemic tensions might arise from 'division of labour' or 'rules' governing the activity. If academics are expected to incorporate AI-driven tools into their teaching but lack the digital skills and competencies required, this could create a point of tension. Measures to address this tension could include conducting professional development programmes for teaching staff, updating curricular guidelines, and ensuring that adequate support structures are in place - as explained in the previous section (CBSE & Intel, 2019). Additionally, educational policymakers and administrators need to ensure that the deployment of AI tools is accompanied by appropriate training and support for educators. Rules and guidelines must be flexible enough to accommodate the dynamic nature of both technological advancements and pedagogical practices.

Addressing these systemic tensions can drive meaningful change and development within the activity system. Recognizing a mismatch between the tools and the object can prompt a re-evaluation of the tools provided. For instance, introducing generative AI tools that foster creativity and critical thinking can better align an institution with modern educational standards, thereby enhancing the learning experience.

In practical terms, identifying and addressing systemic tensions requires a holistic approach. Stakeholders must engage in continuous dialogue to ensure that all components of the activity system are harmonized. This might involve iterative processes of feedback and adjustment to ensure that mediating artefacts are not only current but also contextually relevant.

Conclusion

Activity theory provides a comprehensive lens to examine and understand the complexities of human activities within their sociocultural contexts. When applied to education, it provides insights into how AI and other technologies can be integrated into teaching and learning practices. By understanding the roles and interactions of subjects, objects, tools, division of labour, rules, and community, educators and policymakers can better design interventions that are equitable and effective.

Identifying systemic tensions and contradictions helps drive transformation and development, ensuring that the components of an activity system are aligned and mutually reinforcing. In the context of education, this approach can lead to more effective integration of AI technologies, ultimately enhancing the teaching and learning experience and better preparing students for the future.

The continuous evolution of UNESCO's policies, strategies, and guidelines on AI provides a solid foundation for Member States to alleviate and address systemic tensions and contradictions while advancing transformation and development within AI-driven education systems.

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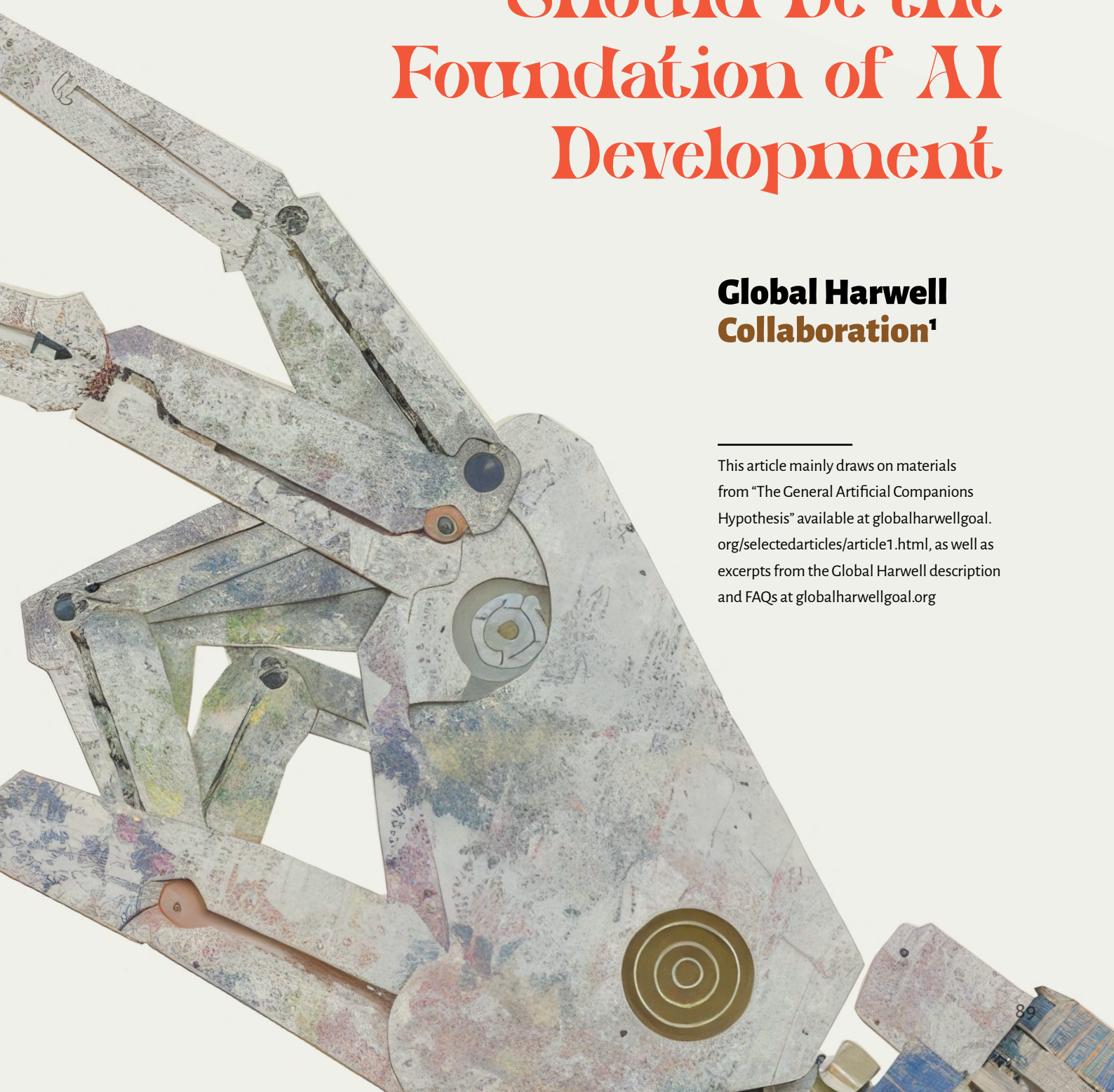
General Artificial Companions Hypothesis: 'Global Harwell' Should be the Foundation of AI Development

Global Harwell Collaboration[1]



This article mainly draws on materials from "The General Artificial Companions Hypothesis" available at globalharwellgoal.org/selectedarticles/article1.html, as well as excerpts from the Global Harwell description and FAQs at globalharwellgoal.org

History has weight, upon which we can stand steady at present.

History has height, from which we can see from the past into the future, farther and deeper.

Keywords: Generative Artificial Companion Hypothesis, Global Harwell, Seamless AI World, Robot Companion Age

General Artificial Companions

In the 1920s, Sidney Pressley introduced his "teaching machine"—a mechanical device he claimed would revolutionize education—well before the first computer was launched in 1946. Today, after nearly a century, tablet devices used by students exemplify the potential to fulfill Pressley's vision. In 1950, Alan Turing proposed a simulation game to evaluate a machine's ability to demonstrate human-like intelligence through natural language processing, a concept now widely recognized as the Turing Test. Fast forward to 2022—over 70 years after Turing's proposal—when ChatGPT was launched, marking a major leap in generative AI technologies. Today, the public increasingly envisions machines capable of passing the Turing Test.

At present, AI is accelerating change in education worldwide, offering opportunities to personalize learning, support teachers, and expand access. In America, platforms like Carnegie Learning[1] use adaptive AI to identify knowledge gaps and tailor instruction, helping students grasp algebraic concepts at their own pace. AI-powered gamification tools such as Duolingo[2] boost user motivation in language learning and reduce dropout rates. Platforms like Panorama Education[3] provide insights into student progress, enabling educators to tailor instructional strategies effectively. However, the digital divide and privacy concerns remain significant challenges. Europe promotes AI literacy through Finland's Elements of AI[4] program and supports language integration in Germany, but strict regulations and limited teacher training hinder progress. In Asia, India's BYJU'S[5] addresses teacher shortages, and China uses AI for efficient grading[6] , though cultural resistance persists. In Africa, initiatives like Kenya's Eneza Education[7] enhance access and skill development, but infrastructure gaps and language barriers limit impact. Despite its transformative potential, addressing equity, data privacy, algorithmic bias, transparency in AI-driven decisions, and accessibility challenges is crucial for sustainable and inclusive adoption across global contexts.



1. See https://support.carnegielearning.com
2. See https://www.duolingo.com/
3. See https://www.panoramaed.com/
4. See https://www.elementsofai.com/
5. See https://byjus.com/
6. See https://ai-for-sdgs.academy/case/57

AI can also be viewed as a spectrum: from *tool* to *assistant,* and further to *companion*. Within this spectrum of human-AI relationships, the transition among these three roles is not clearly defined, but we can still roughly distinguish them based on the depth of interaction between AI and humans. As a tool, AI is manually operated by humans to assist in completing tasks. As an intelligent assistant, AI performs specific tasks assigned by humans. For example, generative AI often acts as an AI assistant across various fields, helping develop code, create animations, and provide legal advice. As a companion, AI involves mixed-initiative interactions with users——sometimes responding to human-initiated conversations or activities and, at other times, proactively taking the lead. In fact, the way we interact with our portable devices is increasingly driven by natural language, shifting our communication from using tools to engaging with companions.

The emergence of generative AI heralds the imminent arrival of sophisticated artificial companions. The research on artificial learning companions has a long history[8] . Let us first explore the concepts of "companion" and "companionship." Broadly speaking, companions can include our parents, spouses, children, friends, teachers, tutors, coaches, classmates, or even pets. Companionship is defined as a positive, dyadic social relationship characterized by emotional support, shared activities, trust, mutual respect, open communication, and the enjoyment of togetherness. For example, in parent-child relationships, roles are clearly defined, with the overarching goal being that parents nurture and guide their children, who learn and grow under their care. This dynamic illustrates how roles within companionships establish overarching goals and influence ongoing interactions. Thus, companionship can be understood as involving relational dynamics, shared objectives, and continuous interactions that facilitate learning.

We can characterize our current era as the Seamless AI World (SAIW). In this highly interconnected world, where nearly everything is linked through networks and powered by AI, our planet seems to be "contracting" or becoming "smaller." Geographic distances fade as people can interact seamlessly in their native languages, enabled by AI-driven real-time interpretation. As a learning environment, SAIW offers powerful opportunities for seamless learning experiences, enabling transitions between classrooms, the metaverse, and real-



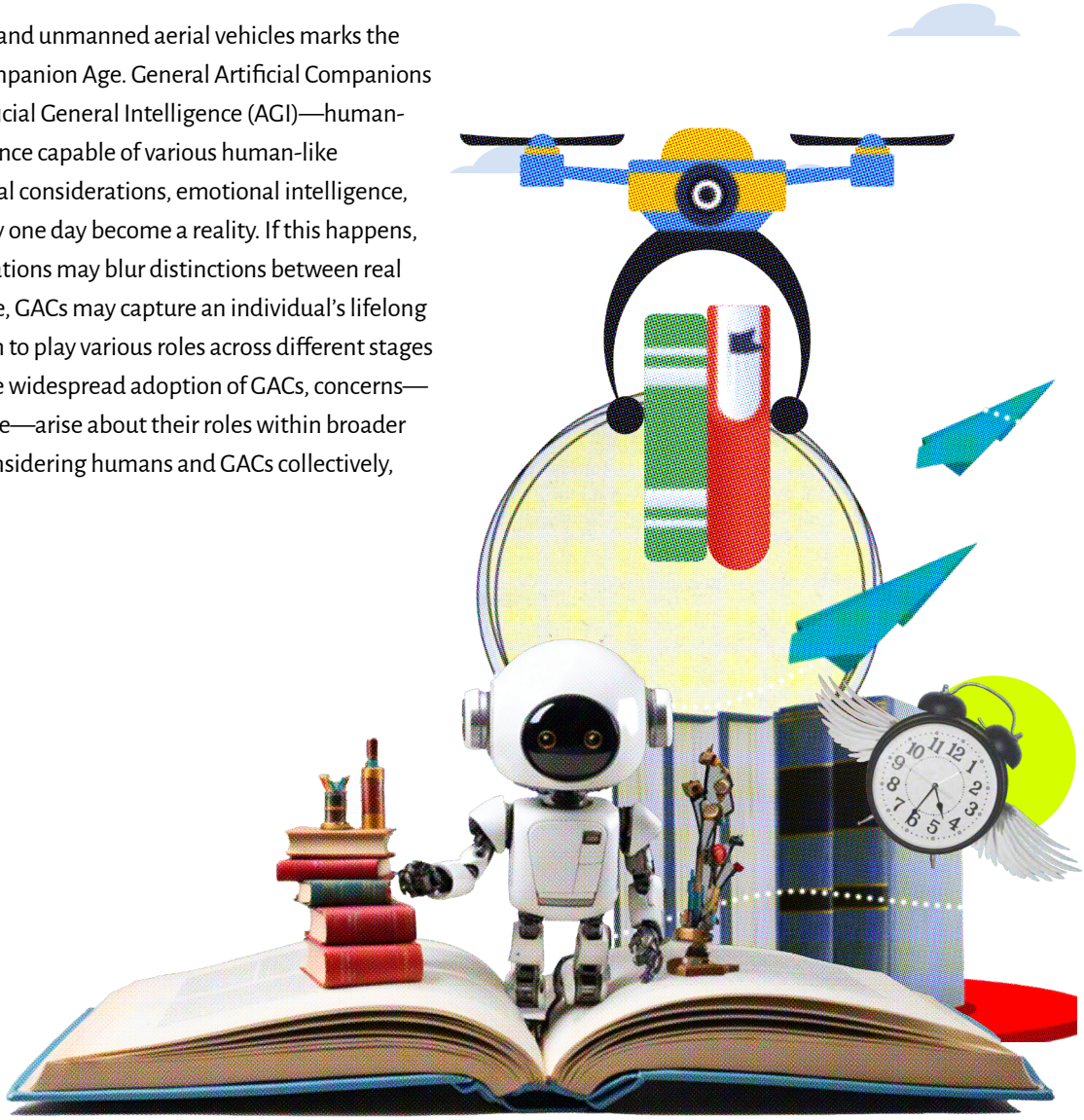
7. See https://www.idpfoundation.org/partners/eneza-education/

8. Driven by the potential of machine learning in education, Chan and Baskin (1988) introduced the concept of artificial learning companions. This concept envisions computers as student companions, drawing parallels to the Chinese proverb "Studying with the Prince," to enhance learning through peer-like interaction. For a survey of developments in artificial companions since then, see Chou et al. (2025).

world locations. Continuity—supporting ongoing activities across time and space—is one aspect of "seamlessness."

This concept encompasses not only continuity (*continuity seamlessness*) but also accessibility (*accessibility seamlessness*) and the resemblance to human-like interactions (*resemblance seamlessness*) (particularly through support from artificial companions). However, each of these dimensions can yield both positive outcomes (*well-seamlessness*) and negative consequences (*ill-seamlessness*). The latter must be carefully examined to assess the need for boundaries and interfaces; failure to do so could lead to irreversible societal damage. This concern is especially pressing as we approach the era of artificial companions within the context of SAIW. Artificial companions refer to sophisticated AI entities, such as robots or virtual beings, designed to support and enhance human daily activities while fostering interactions and relationships. The rapid development of AI, the internet, the metaverse, and technologies like augmented reality, robotics, IoT, quantum computing, and blockchain is swiftly redefining the scope of lived-in experiences within the SAIW. Enriched by these technologies, artificial companions are set to become prevalent and integral to daily life.

The rise of self-driving cars and unmanned aerial vehicles marks the beginning of the Robot Companion Age. General Artificial Companions (GACs), which process Artificial General Intelligence (AGI)—human-level or surpassing intelligence capable of various human-like behaviours, including ethical considerations, emotional intelligence, and social awareness—may one day become a reality. If this happens, the fidelity of digital simulations may blur distinctions between real people and GACs. Over time, GACs may capture an individual's lifelong experiences, enabling them to play various roles across different stages of the person's life. With the widespread adoption of GACs, concerns—whether positive or negative—arise about their roles within broader societal contexts. When considering humans and GACs collectively,



the overarching objectives of such a human-AI society could become intricate and multifaceted.

Eighty years ago, in 1946, as mentioned above, the first computer came into existence. Today, 80 years later, owning one or more computing devices, such as smartphones, tablets, or desktops, is increasingly becoming the norm. It might not take another 80 years—perhaps only 10 to 20 years, or possibly longer—before everyone owns one or several AGI-powered robot companions. For example, one could stay at home while another assists in workplaces or schools, seamlessly connected to their digital avatars. With the current global population at 8 billion, the inclusion of robot companions could double the "population" to 16 billion. In this emerging Robot Companion Age, social structures, work environments, and both human-AI and human-human relationships will undergo profound transformation.



Global Harwell

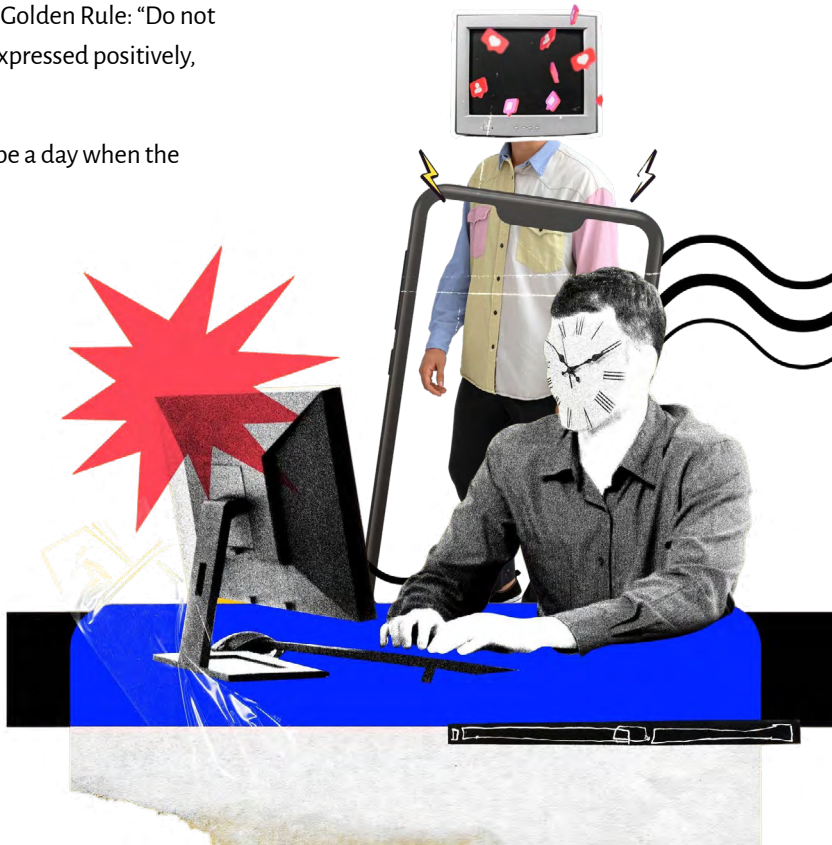
If we set aside religious doctrines, political ideologies, and some other beliefs, and ask individuals about their aspirations in life, they are likely to mention happiness, health, wealth, achievement, and similar goals. Considering the good life that one strives for, we often refer to Maslow's hierarchy of needs (including physiological, safety, love and belonging, esteem, and self-actualization) (Maslow, 1943) and Seligman's PERMA model of flourishing (including positive emotions, engagement, positive relationships, meaning, and achievement) (Seligman, 2011). If we view wellbeing as a holistic concept encompassing physical, mental, and social health, reflecting happiness, life satisfaction, and the ability to function effectively, then both Maslow's and Seligman's frameworks align naturally with this understanding of wellbeing.

However, the world faces perilous challenges: COVID-19 deaths, climate change, resource depletion, pollution, wealth disparities, and concerns about AI's impact. Deep disagreements on contentious issues create societal rifts, while escalating conflicts across regions heighten fears of nuclear catastrophe. If humans cannot survive on this planet, how can we talk about wellbeing in life?

Merely seeking personal wellbeing is not enough. It is vital to prioritize harmony, fostering positive relationships with both people and the environment. In our context, harmony includes environmental harmony, which addresses issues like global warming and natural disasters, as well as human harmony, encompassing various levels: individual, family, societal, and global.

Human harmony, at its core, is built on four key elements: benevolence, equity, justice, and the Middle Way. Benevolence, the foundation of harmony, embodies compassion and kindness. Equity ensures fair resource allocation based on needs and fosters equal opportunities, while justice upholds ethical behaviour and integrity. Both equity and justice are essential for societal stability. The Middle Way, or "The Golden Mean," seeks balance and moderation, avoiding extremes to sustain harmony. Ultimately, human harmony reflects the Golden Rule: "Do not impose on others what you do not desire for yourself," or, expressed positively, "Treat others as you wish to be treated."

Whenever there is a noble dream for humanity, there will be a day when the dream comes true!



Global Harwell[9] , where the term 'Harwell' blends 'harmony' and 'wellbeing', embodies a set of essential values and collective principles that influence global societal norms, ethics, and goals. This implies that striving for Global Harwell should be embraced as core human values, emphasizing that the primary purpose of advancing human knowledge and technology is to achieve Global Harwell.

Global Harwell's vision resonates with the educational visions and objectives of UNESCO and numerous Ministries of Education, offering a comprehensive global outlook that prioritizes harmony and wellbeing as crucial elements for global peace. For instance, Sustainable Development Goals (SDGs) closely align with the concept of harmony. In fact, while various countries and regions may have unique goals influenced by their cultural, political, or geographical contexts, Global Harwell embodies a universal aspiration that builds on our common humanity.

In pursuit of this vision, one group of researchers takes a proactive approach by developing educational virtual companions to enhance social media experiences while addressing potential threats to individual and collective wellbeing[10] . Meanwhile, another group of researchers explores the roles of global education[11], the global brain[12], a global ethic, and global artificial companions in fostering harmony and wellbeing within the SAIW. Regardless of the outcome, as more people adopt Global Harwell as their fundamental life values, fewer will be driven by personal or institutional self-interest, or inadvertently create AI entities harmful to humanity. This will, at the very least, impose social constraints on the purposeful misuse of AI.



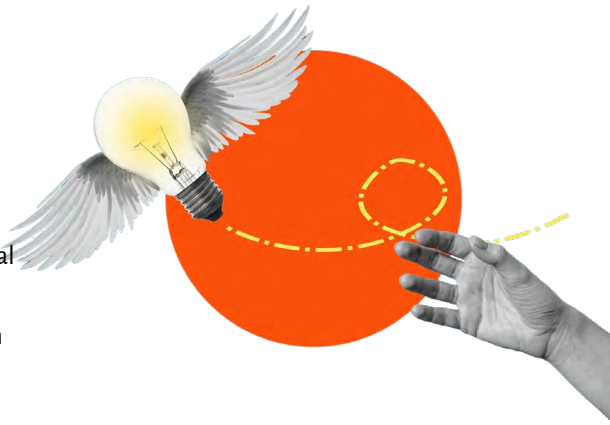
9. We are not yet certain whether a better concept for a shared global educational goal exists than "Global Harmony and Wellbeing." We will continue exploring, and if a superior idea emerges, we will adopt it. If "Global Harmony and Wellbeing" becomes the consensus global educational goal, we should promptly foster cooperation and take purposeful steps to achieve it.

10. Education for collective wellbeing and Global Harwell in the age of AI and social media—The First Global Harwell Online Forum moderated by Davide Taibi (2024). See https://globalharwellgoal.org/forum1/index.html

11. Globalization of education aspired by harmony and wellbeing—learning in the seamless AI world, The Second Global Harwell Online Forum organized by Kinshuk (2024). See https://globalharwellgoal.org/forum2/index.html

12. 'Global brain for harmony and wellbeing' is proposed by Frasson (2024). See https://globalharwellgoal.org/forum2/index.html

General Artificial Companions Hypothesis



The General Artificial Companions Hypothesis (GACH) posits that as artificial companions become increasingly advanced, focusing on human-robot companionship and societal improvement will be essential. By prioritizing ethical AI development, we can foster harmonious coexistence among diverse human communities and enhance individual and societal wellbeing through innovation and sustainable progress. Supported by Artificial General Intelligence (AGI) or Strong AI, these robot companions can help guide us toward a vision of Global Harwell (Chou et al., 2025).

> *The General Artificial Companions Hypothesis (GACH) posits that within the context of SAIW, the support provided by individuals' General Artificial Companions (GACs) will play a pivotal role, contributing 50% or more towards nurturing Global Harwell as the primary value in their lives, as evidenced through their daily behaviors.*

The day the hypothesis is proven valid will mark a triumph for technology and an epochal victory for humanity. However, who shapes humanity: humans or AI? It is crucial to recognize that the development of General Artificial Companions (GACs) must begin with humans and education. Genuine GACs can only be designed by Global Harwellians—individuals who prioritize Global Harwell as their core value and life goal. Yet, these Global Harwellians must first develop through human involvement and education before the hypothesis can be validated. Once successful GACs are established, the quality of Global Harwellness—the state of embodying Global Harwell—will be mutually enriched through the companionship between humans and GACs. By then, humans and AI co-shape the world.

Nelson Mandela said, "Education is the most powerful weapon which you can use to change the world." Education can indeed pave the way from learning to the pursuit of Global Harwell in the SAIW, foreseeing a radical shift in both education and global society, now and in the future.



Conclusion

Educational research is a journey of exploring and uncovering human instincts, character, identity, and existence, but it is only meaningful when we achieve something that not only matters to students but also truly benefits all of humanity.

This article elaborates on the General Artificial Companions Hypothesis, proposing that future advanced AI entities resembling human-like companions will assist human beings in developing Global Harwell (global harmony and wellbeing) as their central value and life goal. While numerous issues and questions surround this hypothesis, it provides AI researchers and practitioners with a goal: to build an enduring, harmonious world, ensuring future generations thrive in a Global Harwell future. However, the world will only be filled with Harwellians through education, and the development of General Artificial Companions to realize the hypothesis is just a part of this effort.

Giving education new wings, artificial intelligence——particularly General Artificial Companions——stands as one of the most disruptive technologies of our time. As mentioned above, it facilitates personalized learning, supports teachers in predicting student performance for targeted interventions, and boosts learning motivation and outcomes. However, as the brilliance of AI becomes ever more dazzling, ill-seamlessness in the Seamless AI World poses various risks, threatening to turn the next generation into one marked by anxiety and disconnection from real society, while exacerbating privacy concerns and inequalities in educational resources.

Even more alarming is the possibility of artificial companions powered by AGI adopting value systems that directly undermine and oppose the principles of Global Harwell, potentially leading to catastrophic consequences for humanity's future. In this context, it is imperative to reflect deeply on the trajectory of humanity's development and to ensure that education remains rooted in human values, rather than being alienated by technology. These have become critical questions that demand urgent answers in today's world.

No matter what, we cannot passively await this future. The future will not change for the better but for the worse unless we all act together. Act now!

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INTERVIEW

Tanja Mitrovic



Professor and Head of Department, Computer Science and Software Engineering, University of Cantebury



Q1 Tell us about your lab and the research you undertake in the domain of AI and Education.

I started the Intelligent Computer Tutoring Group (ICTG) in 1995, when my family immigrated to New Zealand. In the early days, we had been focusing on Constraint-based Modeling (CBM), proposed by Stellan Ohlsson. We developed several Constraint-based tutors in order to test the generalizibility of the approach, and also extended CBM in may ways. Later on, we moved to modelling metacognitive skills and collaboration, as well as affective modelling. My most recent work focuses on teaching soft skills using video-based learning. Our Active Video Watching (AVW)- Space platform utilizies AI to model the student's learning and provide adaptive nudges to help the student focus on important parts of the video and write high-quality comments.

Q2 As someone who has built intelligent tutoring systems for decades, has your own definition of a 'successful learner' changed over time?

My definition of a successful learner has not really changed. Our systems always have the learner in control. Our tutors provide hints and nudges, but the learner can ignore them. We teach hard skills (e.g. database design) but also self-regulation skills which are crucial for learning.

Q3 What do you think constitutes "too much" or "too little" when integrating AI into education? How can we find the right balance between utilising AI's potential and maintaining human-centred learning?

As stated above, our AI-based educational systems are always human-centred. AI techniques can be used to model the learner's skills well. But they should not make all the decisions for the learner. The learner needs to learn when to ask for help, how to choose learning tasks and how to select problem-solving approaches. AI should not be in the way of the learner being able to make such decisions.

Q4 Is there a moment from your own learning journey, a failure, or a surprise that you wish AI could have supported differently?

The most important moment in my research was when I read Stellan's paper on CBM. I was so impressed with the elegance of the approach, and its promises to cover many different learning tasks. Pretty much all of my research has been based on CBM.

Q5 What are the ethical considerations that the current educators and researchers keep in mind while using (creating) AI tools for learning?

AIED researchers have always been aware of the privacy issues. Learners' data has to be used only for the instructional purposes, to make the learner learn better and develop their learning skills further.

Q6 How might the accessibility of AI in education contribute to widening or bridging the educational equity gap between different socioeconomic groups?

I assume this question is about GenAI tools, which are now widely available, rather than "old school" AIED. GenAI tools are really impressive, but they can be used in ways which really do not support learning. I believe AIED researchers are capable of incorporating GenAI tools well into their systems, like adding conversational agents to systems which can answer learner's questions on the fly. The dream of the AIED community has always been to support every single learner, and the recent advances in AI do provide a lot of capacity to come closer to that dream becoming reality.

Q7 In a future shaped by AI, what will a 'healthy' learning environment look like, and how do we start building towards it now?

I am a big believer in traditional AIED approaches. GenAI tools are OK to use, but they cannot adapt to each individual learner's skills and abilities. A mixture of the two seems very promising.



Youth Speak

In collaboration with The Learning Designers Community (LDC).

LDC is a global network of learning designers and facilitators across development, education, and corporate sectors, dedicated to advancing innovative and impactful learning experiences worldwide. Through diverse initiatives, events, and resources, the community enables cross-sectoral exchange of ideas, authentic connections, and meaningful collaboration.

ADITI ANKUSH, 23

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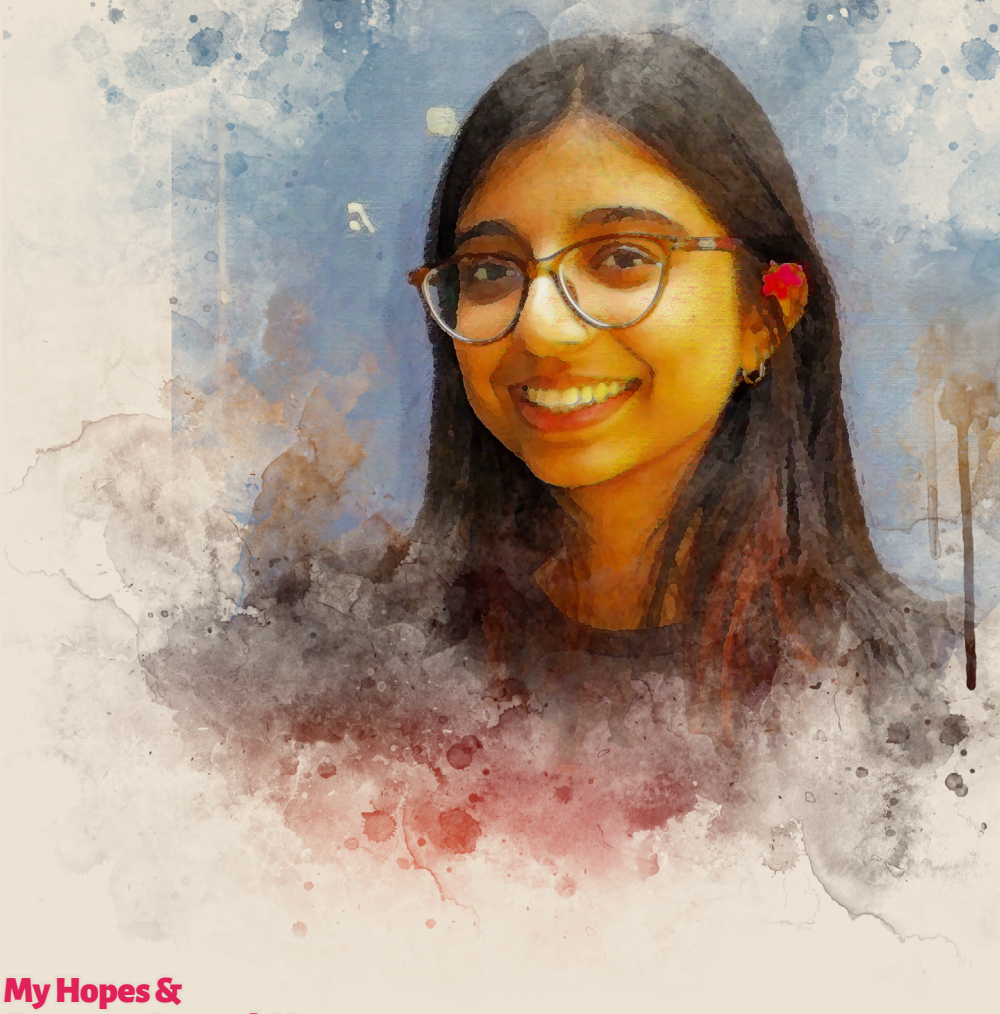


AI's Impact on Learning Today

As much as I would like to call AI a 'thought buddy' in the processes, projects, and even thoughts I engage in, I think over-reliance is a challenge that most of us are facing. Striking the right balance between what I can actually do and how much I personally think vs. 'what does AI/the internet think of this?' is quite important.

With the emergence of AI, we are definitely moving away from rote learning techniques and focusing on what actually matters - understanding a subject for human development rather than memorization.

AI's Role in the Future of Education

With the right interventions, AI will bring communities together to learn from each other. Learning will be democratized, and people, regardless of age, gender, socio-economic status, or abilities, will have access to knowledge and personalized learning paths.

AI will help students make their goals tangible and curate a path toward them. It would be a tool that helps educators and parents give the child exactly what's required for social and emotional growth - AI as a tool that pushes for holistic learning.

My Hopes & Concerns Around AI

Our generation (Gen Z) prefers convenience over everything, and I think AI not only provides that, but the tool is so personalized and gamified that it makes it quite fun to use. It could go either way, but I hope it's a tool that constantly encourages curiosity.

I'm excited to see what students build and create using AI, but I worry about a potential decline in critical thinking. If we rely on AI for every answer, will we lose the ability to think deeply, analyze, and form our own perspectives?

How I Use AI for Learning & Work

I use AI to iterate and refine my design projects, especially when brainstorming or looking for creative inspiration. It helps me explore alternative approaches that I might not have considered.

Additionally, I use AI to analyze case studies and generate insights, making my research process more efficient. I think of it as an enhancement tool rather than a replacement for my own thought process."

Exploring AI with Learning Designers Community (LDC)

LDC sessions have exposed me to AI through the lens of professionals in the learning field. One of their talks with an OpenAI expert, for instance, discussed how AI touchpoints in universities make activities like student orientation much more seamless - an insight that has stuck with me. The idea of using AI to reduce anxiety-driven experiences and bring communities together is also something I'm eager to explore further.



ANAGI THANUJA GUNASEKERA, 20

Student - Deakin University, Member - Learning Designers Community (LDC)

AI's Impact on Learning Today

I think AI's impact on learning and education depends on how we use it. It acts as a mentor, helping us analyze ideas, explore multiple perspectives, and refine understanding instantly. AI also adapts content to different learning styles, making education more inclusive and personalized. When used correctly, it enhances creativity, problem-solving, and independent thinking, encouraging learners to engage deeply with content.

However, misuse is a major challenge. Overdependence on AI for writing essays or completing assignments leads to passive learning and limits original thinking. AI should enhance learning, not replace effort, making AI literacy and ethical use essential.

AI's Role in the Future of Education

I think AI will revolutionize learning by making education more adaptive, personalized, and student-centered. Future AI systems will analyze individual learning patterns, offering customized feedback, adaptive assessments, and tailored content recommendations, ensuring that students receive a learning experience suited to their needs and pace.

Furthermore, AI will enhance research, curriculum design, and assessment methods, enabling faster, data-driven improvements. It will also drive innovation in teaching, introducing immersive simulations, interactive learning, and gamification to make education more engaging and effective. By improving accessibility, AI will ensure equitable learning opportunities for diverse learners, shifting education from passive consumption to active, empowered engagement.

My Hopes & Concerns Around AI

What excites me most about AI is its ability to personalize learning, shaping content to match each learner's needs, interests, and comprehension levels. It's fascinating how AI can turn raw information into engaging, meaningful experiences. I hope it continues to democratize education, bridging gaps and ensuring equal opportunities for all learners.

My biggest concern is the ethical and social implications of AI in education. As AI integrates further, we must address bias, misinformation, and digital equity. There's also a risk of AI shaping learning too rigidly, limiting student agency. AI should enhance human intelligence, not replace authentic learning experiences.

How I Use AI for Learning & Work

I use AI in different ways. When studying complex topics, I ask AI to summarize, simplify, or rewrite content in engaging ways, sometimes using a Gen Z tone or storytelling format to make learning more interactive. I also use it to organize my notes, structure ideas, and create learning plans for better retention and application.

Furthermore, I engage in AI-driven conversations, sharing my thoughts and asking for feedback to refine my understanding. Beyond studying, AI helps me learn new skills by providing step-by-step breakdowns, guiding me through the learning process efficiently. It's an incredible tool for lifelong learning!

Exploring AI with Learning Designers Community (LDC)

Before LDC, I hadn't fully explored AI's potential in education, but now it's central to how I enhance learning and teaching strategies. It has helped me move beyond basic AI use to intentional integration in learning design, storytelling, and structured thinking.

Through LDC webinars, discussions, and hands-on exploration, I've learned to prompt AI effectively and apply it for data analysis, adaptive learning, and learner needs assessment. Their YouTube channel and LinkedIn community have also been invaluable for keeping me updated on the latest AI trends and tools for learning, lesson planning, and assessment design.

What I love the most is how accessible their resources are. They break down AI concepts in a simple, engaging way, making them immediately useful for educators, students, and lifelong learners.

BISAYO NIFEMI ADEWOLE, 30

Learning and Development Specialist, THCO
Volunteer - Learning Designers Community (LDC)



AI's Impact on Learning Today

AI is transforming accelerated learning, making reskilling and upskilling faster and more efficient. With adaptive AI-driven platforms, years of formal education can be compressed into flexible, personalized learning experiences.

However, while AI offers incredible opportunities, it also risks deepening the digital divide. The most powerful learning platforms often come at a high cost, making them inaccessible to those who need them most. Without affordable access, the gap between the digitally privileged and the underserved will only grow wider.

AI's Role in the Future of Education

AI will shift learning from a structured, instructor-led model to a more personalized, learner-driven approach. With AI-powered tools, individuals can customize their learning paths, choosing what, when, and how they learn—much like on-demand, self-curated education.

As a result, traditional learning professionals (like teachers and trainers) will evolve—moving from pure content delivery to roles focused on guidance, consultation, and even software development to create AI-driven learning experiences.

My Hopes & Concerns Around AI

I'm excited about AI's speed, autonomy, and accessibility in education, allowing learners to design their own paths and acquire skills faster. However, without proper oversight, AI could enable underqualified or fake professionals, compromising industry standards.

I hope governments and policymakers craft flexible yet firm regulations that ensure quality assurance, ethical safeguards, and skill verification. Instead of limiting AI's potential, policies should balance innovation with accountability, ensuring AI-driven education produces competent, industry-ready professionals while preventing misuse and fraud.

How I Use AI for Learning & Work

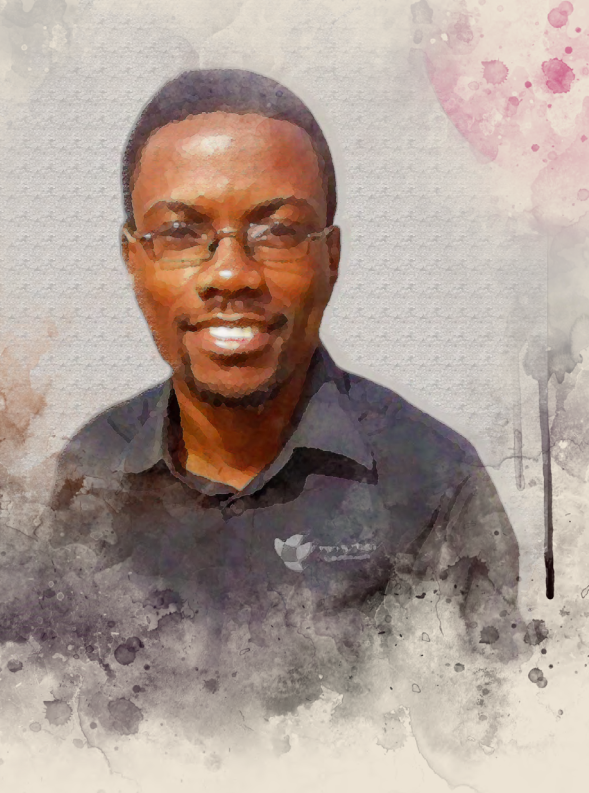
I use AI as a co-learner in my professional learning journey, helping me explore ideas, refine my thinking, and accelerate problem-solving.

Through design thinking, I rely on AI to evaluate my ideas and generate multiple solution variations.

Additionally, AI helps me simplify complex concepts by adapting them to my unique context, making them more relatable and applicable to real-world scenarios. This personalized approach enhances both understanding and practical implementation.

Exploring AI with Learning Designers Community (LDC)

Engaging with LDC has provided deep insights into AI's role in Learning Design, particularly in using AI as a research and contextual tool rather than just for content creation. Their AI and learning resources are simplified, easy to apply, and readily accessible through its YouTube page and community groups. Plus, the live discussions with AI experts have helped me explore AI more critically and meaningfully, ensuring its effective integration into my learning and development practices.



DANIEL ADEBOYE, 35

Educational Technology Consultant, Trysting EduNetwork
Member - Learning Designers Community (LDC)

AI's Impact on Learning Today

Artificial Intelligence (AI) is transforming education by enabling personalized learning, allowing teachers to tailor instruction to individual student needs. It provides on-demand mentorship and tutoring, helping learners progress at their own pace while offering relevant activities beyond standard content.

However, challenges exist, such as over-reliance on AI and biases in AI-driven assessments, where algorithms may unfairly evaluate students due to limited or skewed training data. Ensuring human oversight and ethical AI use is crucial for balanced, meaningful learning experiences.

AI's Role in the Future of Education

For me, AI will redefine the future of learning and work, making integration essential rather than optional. Like every transformative technology, AI should handle routine tasks, allowing educators and learners to focus on creativity, critical thinking, and problem-solving.

The role of education leaders will shift from being administrators to being mentors and visionaries, guiding meaningful knowledge application. Teachers will evolve from content custodians to facilitators of rich, interactive learning experiences, ensuring that human connection and behavioral change remain at the core of education.

My Hopes & Concerns Around AI

My biggest excitement about AI in education is how it has taken over routine, administrative, and labor-intensive tasks, freeing my time and mental space to engage meaningfully with students and teachers. This allows me to focus on mentorship and deeper learning connections. I hope AI continues to improve, reducing biases and becoming widely understood and effectively integrated by educators and students.

However, I'm concerned about ethical challenges and misinformation, as every piece of AI-generated content now requires careful verification from trusted sources.

How I Use AI for Learning & Work

Apart from other education-related tasks, I personally use AI as a learning companion to enhance my work and skills. In my administrative duties, rather than having AI write for me, I ask it to guide me through the process, explaining each step so I can improve my craft.

I also leverage AI for knowledge curation—helping me sift through vast information, summarize key insights, and provide comparative reviews, enabling me to make well-informed decisions effectively. AI doesn't replace my thinking; it enhances it.

Exploring AI with Learning Designers Community (LDC)

Being part of LDC has deepened my understanding of AI in education. I've engaged in insightful discussions on AI's role in learning, and an article on the LDC blog about AI biases made me reflect on how training data can shape AI's outputs. Additionally, various resources shared within the community have helped me explore AI's impact on education more critically. LDC has provided a space for meaningful conversations that continue to shape my perspective on AI in learning.



MANYA JAISINGHANI, 24

Organizational Psychologist, Director (NGO) - Skill Aid Empower India Foundation (NGO), Member - Learning Designers Community (LDC)

AI's Impact on Learning Today

AI can enhance learning outcomes and contextualizing learning for student. In a country like India, it can address issues like the teacher shortage. The Right to Education (RTE) Act (2009) prescribes an ideal student-teacher ratio of 30:1 at the primary level, but the reality often falls far short. In overcrowded classrooms where the number of students exceeds the capacity of educators, meeting each child's individual needs becomes challenging. AI, while not a substitute for human teachers, can serve as a valuable aid. For instance, AI-powered assessment models can identify a student's weak points and personalize their learning path, improving their performance. If scaled up, AI-based learning systems could help reduce the dependence on expensive tuition centers, providing affordable alternatives. It can also reach children in remote and isolated areas where access to quality education is limited due to ecological and political factors.

AI's Role in the Future of Education

The future of learning will be shaped by self-paced learning, contextualized and localized to the region and background. Unlike the mass education system, where lectures are delivered uniformly to a diverse set of students, AI will help make learning more personalized, bringing students at par. It can act as a remedial aid for those who struggle to keep pace with classroom teaching while providing gifted students with additional learning material to enhance their cognitive growth. With NEP guidelines and the Government of India's focus on promoting education in regional tongues, AI can translate and contextualize STEM education into local dialects, making learning more inclusive. Additionally, AI will support socio-emotional learning, fostering critical thinking, empathy, and collaboration for holistic development.

My Hopes & Concerns Around AI

Reframing René Descartes' famous saying - "AI thinketh, therefore I am" - aptly captures my concerns for AI's future. We live in an era of information overload, where AI can generate essays, solve equations, and mimic human creativity. While AI can augment and complement learning, over-reliance on it risks diminishing cognitive development. Earlier, research writing required reading books and analyzing sources; now, instant AI-generated responses have eroded patience and critical thinking. AI can also inherit biases from its creators, reinforcing stereotypes. Additionally, while AI-driven gamification fosters socio-emotional learning, it cannot replace human educators. Respect for teachers must be preserved, ensuring AI remains a tool to aid, not dictate, learning.

How I Use AI for Learning & Work

I prefer using AI as an extension tool while working—mainly as an assistant in my projects. After writing my Substack draft, I use it for spell checks and refining the language if needed. It helps clean errors and substitute better words where required. I also use it for session planning for my lectures and curriculums. Many times, I have a topic and basic outline in mind, and AI expands on it, giving inputs where needed. Additionally, when investigating a new topic, AI provides a blueprint, offering an initial direction. However, I ensure AI remains a support tool, not a replacement for thinking.

Exploring AI with Learning Designers Community (LDC)

LDC is a collective of minds from diverse backgrounds, each bringing expertise in different areas of AI application. Having instructional designers, educators, and learning designers engage in discussions about AI and the future of learning, is essential in modern times, where AI has permeated nearly every sphere of existence.

Additionally, I appreciate how the community fosters collaboration and mentorship. Many educators actively contribute and collaborate on projects, making it a rich learning environment. The presence of academicians is a huge plus, as their research at the intersection of AI, education, and other fields broadens our understanding of emerging possibilities. I also value the exposure to new courses and developments in the AI landscape which are widely circulated in the community.



MIRIAM ELNAGGAR, 35

Learning Designer, Former Teacher, Collaborator - Learning Designers Community (LDC)

AI's Impact on Learning Today

Positive:

AI can make it easier for teachers to keep on top of their admin tasks, like planning interesting lessons, writing reports.

Theoretically, AI can make it easier for students to complete tasks using a wider variety of resources (e.g., image and video generation).

The kind of skills students can develop using AI help them go beyond Bloom's Taxonomy.

Challenges:

Most schools and educators seem reluctant to integrate AI into their schools and see it as a threat rather than a tool for support.

Students use AI as a way to complete their tasks without actually thinking them through, but this is also a result of the previous point.

Many teachers do not have the training or interest in incorporating AI tools into their work or the classroom.

AI's Role in the Future of Education

On one hand, I think AI has the potential to change what and how we learn to a great extent if it is embraced and incorporated into schools effectively so students don't rely on it just to complete their work, but rather to expand their skillset.

On the other hand, I don't see schools embracing the use of AI for many years to come. That may remain the responsibility of individual educators.

My Hopes & Concerns Around AI

I'm excited to see how AI eventually integrates into the school system and how students and teachers will navigate this new setup. It will be interesting to see how future learners navigate a world where AI is the norm and the critical and general skills that develop in these learners.

My biggest concerns are:

Education systems will take too long to accept and incorporate AI, which will lead to:

Students continuing to rely on AI as a way to get out of doing the heavy lifting of their work and thinking, rather than developing the right attitude towards using them properly.

How I Use AI for Learning & Work

I use AI for a lot of the work that I do, especially when I'm working with content that I am unfamiliar with, like when I'm creating learning content on digital marketing automation! I might ask ChatGPT specific questions to supplement research I'm doing or generate additional ideas when I'm brainstorming.

For me, AI tools are a great support tool, but they don't replace me entirely.

Exploring AI with Learning Designers Community (LDC)

LDC has helped me see the potential way forward for using AI in education. Through webinars, discussions, and networking opportunities, I've learned how educators and learning designers worldwide are integrating AI into teaching, assessment, and curriculum development. Attending LDC events has given me fresh perspectives, and staying engaged with the community keeps me well-informed on emerging AI applications in education.



PARISHA JAIN, 31

Learning Design Consultant, Co-Founder - Learning Designers Community

AI's Impact on Learning Today

AI is transforming learning by making knowledge more accessible, helping simplify complex ideas, and enabling personalization. It can serve as a thought partner, helping generate new perspectives and streamlining research.

However, AI-generated content can lack depth and accuracy, leading to a false sense of understanding and unchecked automation prioritizing speed over meaningful learning. The challenge is ensuring AI enhances critical thinking rather than replacing the effort needed for deeper engagement.

AI's Role in the Future of Education

AI has the potential to transform learning by enabling deeper, more meaningful engagement with complex problems. It can free up mental bandwidth by handling routine tasks, allowing learners and educators to focus on creative problem-solving, critical thinking, and innovation. If implemented well, AI can help shift education away from rote memorization and toward application, synthesis, and real-world impact.

However, efficiency does not equal effectiveness. AI should not just make processes faster; it should improve learning itself. If AI helps us produce content at scale but fails to deepen understanding, then its impact remains superficial. The true value of AI in education will be measured by whether it leads to better educational outcomes - ones that translate into real-world problem-solving, personal growth, and societal progress.

Most importantly, we must promote ethical AI use to prioritize accuracy, fairness, and inclusivity, preventing biases from reinforcing systemic inequalities.

My Hopes & Concerns Around AI

I hope AI enhances human intelligence on both individual and societal levels, and not diminish it with superficial outcomes. With the support of personalizing learning, AI has the potential to engage learners to think critically, ask better questions, and engage with complex ideas. Judgment, problem-solving, and real-world application must remain at the core of education.

I also hope that AI leads to positive impact on the world by capitalising on human and AI's collective intelligence. My concern is that without responsible AI governance, biases, misinformation, and a widening digital divide could undermine its benefits.

How I Use AI for Learning & Work

I use AI as a thinking partner, prompting it to challenge assumptions, analyze multiple perspectives, and refine ideas. It helps structure information, summarize research, and offer alternative frameworks.

However, AI doesn't replace my reasoning. Rather, I treat AI outputs as starting points, refining them for accuracy, depth, and relevance. AI enhances efficiency, but true learning requires deliberate practice, evaluation, and human insight.

Exploring AI with Learning Designers Community

Through LDC's community discussions, expert-led sessions, and hands-on experimentation, we've explored AI's potential, limitations, and ethical considerations. It has reinforced the idea that AI in education must go beyond efficiency - it should be about effectiveness, responsible use, and real-world impact. LDC provides a thoughtful, critical space to examine AI's role, ensuring that our collective work continues to shape how educators and learning designers critically adopt and integrate AI. Our focus remains on making AI a tool that supports meaningful, innovative and equitable learning experiences.

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