

The Unintended Consequences of Artificial Intelligence and Education

Executive summary

Wayne Holmes

October 2023

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As has become obvious in recent months, Artificial Intelligence (AI) is increasingly impacting on many aspects of our daily lives. This is no less true in education (AI&ED). However, how AI will impact education, how it will affect teaching and learning and how it might change the roles of teachers and learners, remains uncertain. Accordingly, this report sets out to provide an analysis of the current state of AI&ED, including its potential benefits and risks, as well as the role of teachers and teacher trade unionists in ensuring that teaching with and about AI is aligned with the principles of social justice and human rights.

To provide a context for AI&ED, the report begins with an overview of AI – defining it as a field of computer science that seeks to develop machines capable of performing tasks that would typically require human intelligence. AI has been researched since the 1950s but it has made recent dramatic progress thanks

(...) ensuring that teaching with and about AI is aligned with the principles of social justice and human rights.

to advancements in computing power, the availability of large amounts of data, and some innovative computational approaches. Today, there does not appear to be any aspect of life in which AI is not involved. AI systems underpin everything from mobile phones apps to online shopping, weather forecasts to medical diagnostics, financial and legal

services to autonomous vehicles, and much more besides. However, while these developments might appear exciting, AI also raises multiple concerns, such as privacy and security risks, harmful biases, job displacement, and other potentially negative impacts of AI on society. For these reasons, there is increasingly a need for transparency

and accountability in AI systems, as well as greater attention to issues of disempowerment and social inequity.



The report then moves onto AI&ED itself, discussing the connections between AI and education in term of two components: teaching and learning with AI (also known as AIED), and teaching and learning about AI (also known as AI Literacy).

AIED is itself complex. There are at least twenty different types of AIED, such that it is not possible to make general claims about its efficacy or safety. Instead, it is important to consider each application, or at least each type of application, separately, and to be clear about which of the multiple variations of AIED applications are being discussed. Accordingly, the report divides AIED into three overlapping categories:

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institution-focused, student-focused, and teacher-focused AIED, and having first discussed what they involve and their implications, goes onto give detailed examples (the intention being to illustrate the complexity of this space).

Student-focused AIED is where most of the excitement and the money is currently found. It has been researched for more than forty years and is now offered around the world by thousands of SMEs and large numbers of million-dollar-funded companies. This commercialisation of education has become an increasingly concerning issue, as companies seek to exploit new data-rich business models, inevitably undermining the principle of education as a public good. Examples of student-focused AIED include adaptive tutoring systems, dialogue-based tutoring systems, virtual writing assistants, automatic writing evaluation, and chatbots – each of which aims to automate one or more functions of a teacher’s role.

Meanwhile, teacher-focused AIED remains mostly speculative. In other words, applications to genuinely support teachers (rather than to replace teacher functions) have not received much attention and there are only a few available examples (such as the automatic curation of learning materials, and classroom monitoring and orchestration). Finally, there is institution-focused AIED which includes AI-enabled tools designed to help with student recruitment, security, finances, and other unglamorous back-end administrative tasks that educational institutions need to do. This is probably the least visible type of AIED, although in the future it may become the most influential.

In fact, many AIED tools are questionable, whether for ethical, pedagogical, or educational reasons. In particular, they may reinforce existing biases and inequities, involve the commercial exploitation of student data, embed primitive approaches to pedagogy, and exacerbate the divide between the privileged and underprivileged, particularly in developing nations. In addition, as this report repeatedly notes, there is limited independent evidence at scale for the efficacy or safety of AI in education, or for any of the claimed benefits.

The importance of AI Literacy, teaching and learning about AI, is then discussed. Universities across Europe and beyond have been offering degrees in a range of AI subjects for years, but teaching about AI in schools remains relatively uncommon, and

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when it does exist it mostly focusses on the technology. However, AI Literacy comprises a human as well as a technological dimension. While the technological dimension is about how AI works, the techniques and technologies involved and how to create it, the human dimension is about the social, ethical, and rights implications of AI. In fact, teachers and

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teacher trade unionists play a crucial role in ensuring that teaching about AI supports human rights and social justice, empowers teachers, and supports student agency – which can only be achieved by involving all stakeholders, especially teachers, but also students, parents, and other community members.

The report culminates in a consideration of several key issues raised by AI&ED and some recommendations. The first issue centres on intelligence: the claim that AI is intelligent, and the negative implications this can have for society and education. While AI has the ability to process and analyse vast amounts of data at speeds beyond human capabilities, and while it may mimic intelligent behaviour and sometimes even appears intelligent, it actually lacks consciousness and any real understanding. The fact is that no AI system is capable of replicating the nuanced and complex thinking of human intelligence. Accordingly, the suggestion that AI is intelligent can lead to a devaluation of human intelligence, an over-

reliance on AI systems, and a neglect of the social and emotional aspects of learning, all of which are crucial for human flourishing.

The report also questions the broad push for AI-enabled personalised learning, which has been proposed for almost a hundred years as a remedy for various educational problems, such as student disengagement, lack of motivation, and achievement gaps. However, AI-enabled personalised learning is deeply influenced by the Silicon Valley perspective, which overemphasises technology and individualism at the expense of community. One of the significant drawbacks of AI-enabled personalised learning (which is quite different to differentiated teaching) is the potential erosion of social interactions in education, critical for fostering trust, motivation, and engagement. Meanwhile, by overly emphasising individual learning paths, it can actually undermine students' self-actualisation, leading to homogenised learning outcomes. It can also downplay the crucial role of education in community-building and social skills development, ignore the holistic development of students, and potentially perpetuate socio-economic and cultural disparities.

In addition, the report considers AIED's disempowerment of teachers, reducing their role to mere technology operators while decisions about what and how students should learn are made by the commercial organisations behind the AI. This diminishes the professionalism and expertise of teachers and turns education

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into a commodity, where teachers are seen as service providers. Instead, AIED should be designed to support teachers rather than replace them, but many AI applications only displace teachers' time as they struggle to make the system work for their specific classroom needs. While some policymakers might see potential cost savings in automating tasks like grading, implementing AIED to replace teachers compromises classroom practices, reduces educational quality, and undermines students' rights and success.

AIED is also contributing significantly to the escalating commercialisation of education, which poses significant risks to the sector's integrity, and undermines education as a shared public good. Companies inevitably prioritise profit over efficacy and safety, human rights and social justice, all of which could lead to exclusive, inaccessible and unaccountable educational systems. Particularly concerning is the potential for AIED to reinforce existing biases and inequities, heightening the divide between

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privileged and underprivileged students. In addition, AIED's emphasis on standardised testing and measurable outcomes overlooks individual student needs and stifles teacher creativity. Other concerns include the exploitation of student data

(which threatens privacy and surveillance issues), the risk of a new digital divide, the potential loss of human interaction, and the possibility of a narrow, technocratic view of education. Commercialisation could also degrade the role of teachers, reducing them to service providers (the

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person who switches on the computers and maintains classroom behaviour), which both fundamentally misunderstands and underestimates the expertise and responsibilities of teacher professionals.

In addition, the adoption of AIED by developing nations, driven by Western or Chinese organisations, can inadvertently perpetuate neo-colonialism, reinforcing existing power imbalances and systemic inequities. AI tools, such as adaptive tutoring systems, often unintentionally incorporate inherent cultural biases favouring Global North cultures and languages, leading to cultural hegemony and marginalising local languages and cultures. This deployment of AIED is usually disconnected from local contexts, and can further marginalise underprivileged students. One potential solution is locally-led, community-driven AIED that is sensitive to local needs and contexts. Ensuring the application of AIED adheres to principles of transparency, accountability, and ethical

responsibility is also crucial to prevent reinforcing existing power dynamics.

In fact, ethics is essential for responsible AI innovation in education – particularly the principles of ethics by design. This means actively embedding ethical considerations in the development of AIED from the outset, ensuring transparency, data privacy, bias mitigation, and human-centeredness throughout. Transparency enables understanding how AI decisions are made and data is used, bolstering trust. Privacy involves responsibly managing student data to maintain user trust and protect sensitive information. Addressing biases and promoting fairness prevents potential discrimination and inequities in educational settings. Maintaining human agency ensures AI supplements but does not replace human educators or decision-making. Constructivist pedagogies can be incorporated into AI systems, promoting active engagement and critical thinking. In essence, ethics by design might help harness the potential of AI while preserving human values and encouraging effective teaching and learning practices.

Finally, the report concludes that teachers and teacher trade unionists hold a pivotal role in ensuring that AI in education aligns with human rights, social justice, and supports teacher and student agency. This may be achieved by continuing to advocate for democratic control over education and the ethical use of AIED, underpinned by human-centric AI Literacy (that includes the human dimension as well as the technological dimension of AI). Empowering teachers with AI training and inclusion in AI decision-making processes can help them effectively support their students' AI Literacy, while enabling them to decide whether and which AI tools to use in their classrooms. In addition, advocating for transparency, accountability, and regulation of AI in education is paramount. Involving all stakeholders – teachers, students, parents,

and community members - can reinforce the alignment of AI with human rights and social justice. Lastly, teachers and trade unionists need to critically engage with the narrative around AI in education, questioning unsubstantiated claims, demanding evidence of efficacy and safety, ensuring that key decisions about AI in teaching are collectively made by educators, and avoiding the unintended consequences of AIED.

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Recommendations

Ethics by design

Ethics by design is a crucial concept that serves as a foundation for innovation, including the application of Artificial Intelligence in education. It goes beyond mere compliance with regulations and standards; it entails actively considering ethical implications and embedding ethical principles into the design and development of educational technologies and AI systems from the beginning. By embracing ethics by design, educators and technologists can ensure that innovation in education aligns with ethical values and facilitates good practices.

In the context of AI in education, ethics by design involves several key principles. First and foremost, transparency and explainability are essential. AI systems used in education should be designed in a way that allows users to understand how decisions are made, what data is used, and the potential biases and limitations of the technology – although note that this, although essential, is not an easy technical challenge for the AI engineers. Implemented well, transparency and explainability can empower teachers, students, and other stakeholders to engage with the technology more effectively and can enable them to make informed decisions. It allows teachers to be confident that they understand the AI-enabled system's output, so that they can challenge and/or overturn its recommendations and retain control of decision making in classrooms.

Second, privacy and data protection are fundamental considerations. Educational institutions and technology developers must prioritise the responsible collection, storage, and use of student data.

Implementing robust security measures and adhering to relevant privacy regulations helping to build trust among users.

Third, ethics by design involves addressing biases and promoting fairness. AI algorithms can unintentionally reflect and amplify societal biases, leading to potential discrimination and inequities in educational settings. By proactively identifying and mitigating biases during the development stage, AI technologies might contribute to equitable access to quality education for all learners.

Fourth, the ethical design of AIED must foster human agency and accountability. While AI might provide valuable support and insights, it cannot replace human educators or decision-making processes. Maintaining a human-centred approach ensures that education, as a social and democratic institution, allows for critical reflection, context-specific judgment, and individualised support (to be distinguished from the personalised learning that so many AI-enabled applications claim to provide) that takes into account not only the unique needs but also the unique circumstances and diverse perspectives of each learner.

Finally, ethics by design involves the choice of pedagogy embedded in the AIED. It advocates for a shift away from traditional didactic approaches towards constructivist approaches. Didactic approaches typically assume a one-way transfer of knowledge from the teacher to the students, often relying on passive learning experiences. In contrast, constructivist approaches emphasise active engagement, critical thinking, and collaborative learning, where students construct their own knowledge through meaningful interactions and

hands-on experiences. In other words, when designing AIED, it is essential to consider how they can support constructivist pedagogies, enabling students to explore and construct knowledge. By offering adaptive feedback, interactive simulations, and opportunities for inquiry-based learning, AIED that is ethical by design might facilitate student-centred approaches that promote deeper understanding and active participation.

In summary, ethics by design in the realm of AI and education aims to harness the potential of innovative technologies while safeguarding human values and promoting positive learning experiences. It emphasises proactive measures to anticipate and prevent harm, rather than merely reacting to ethical issues after they arise. By embracing ethics by design, education might leverage the power of AI to enhance teaching, learning, and educational outcomes in a responsible and ethical manner – something that we are yet to see.

The role of teachers and teacher trade unionists

Teachers and teacher trade unionists play a crucial role in ensuring that teaching with AI and teaching about AI supports human rights and social justice, strengthens education as a democratic and accountable public good, empowers teachers, and supports student agency. They can do this by advocating for greater democratic control over education, by defining the educational problems that the AIED tools aim to solve (rather than being passive recipients), by ensuring that AI tools are used in a responsible and ethical manner that takes into account the human dimension of AI literacy, and by being genuinely involved by the developers in the design of the AIED applications.

One way to ensure that teachers retain control of their classrooms is to provide

them with the training and support they need to effectively evaluate AI tools and incorporate them into their teaching practice. This can involve providing teachers with opportunities to learn about AI and its potential impact on education, as well as providing them with the resources and tools they need to evaluate the effectiveness of different AI tools in their classroom.

Another way to ensure that teachers retain control of their classrooms is to ensure that they are involved in the decision-making process regarding the use of AI tools in education. All teachers, not just teachers of computer science or related subjects, should be consulted and involved in the selection and evaluation of AI tools, as well as in the development of AI literacy curricula. This can help to ensure that the use of AI in education is aligned with the principles of social justice and human rights, and that the human dimension of AI literacy is effectively taught.

Moreover, teachers and teacher trade unionists can play a key role in advocating for greater transparency and accountability in the use of AI tools in education. This can involve advocating for greater regulation and oversight of AIED tools, as well as ensuring that the tools are used in a way that is consistent with human rights principles.

It is also essential to involve other stakeholders in the process. Alongside teachers, this includes students, parents, and other community members. By involving all stakeholders in the process, it is possible to ensure that the use of AI in education is aligned with the principles of social justice and human rights, and that the human dimension of AI literacy is effectively taught.

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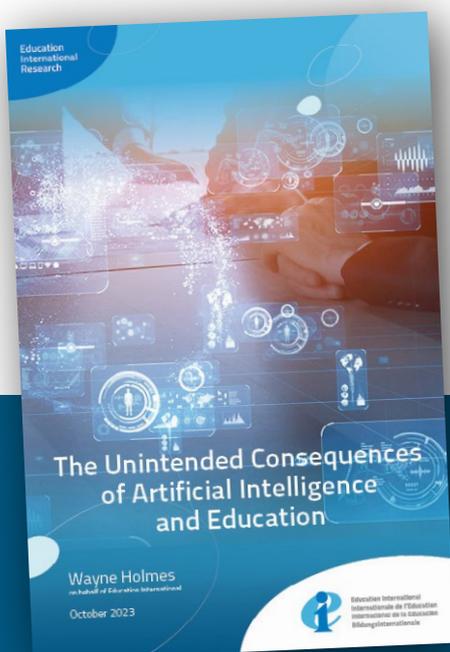
and supports student agency. However, to ensure that teachers retain control of their classrooms, it is essential to provide them with the training and support they need to effectively evaluate AI tools and how to incorporate them (if appropriate) into their teaching practice.

As a final note, the arrival and wide take-up of Artificial Intelligence-enabled tools in educational contexts is often taken to be an application of technology that is to the benefit of everyone – students, teachers, and wider society. However, it is increasingly clear that the narrative promoted by the tech industry, that technology equates to progress, misdirects our attention. There remains little evidence that what is good for the technology industry is good for the world; similarly, there is little evidence that what is promoted by the AIED industry is good for students and teachers. In fact, while it is true that, on average over recent centuries, living standards have improved across the world, this is not necessarily due to technological advances. To the contrary, as a recent publication notes:

“Today’s ‘progress’ is again enriching a small group of entrepreneurs and investors, whereas most people are disempowered and benefit little... The broad-based prosperity of

the past was not the result of any automatic, guaranteed gains of technological progress... Most people around the globe today are better off than our ancestors because citizens and workers in earlier industrial societies organised, challenged elite-dominated choices about technology and work conditions, and forced ways of sharing the gains from technical improvements more equitably.” (Johnson & Acemoglu, 2023, p. v)

Accordingly, if the human right of students to receive a quality education is to be protected, and if teachers are not to be disempowered, teachers and teacher trade unionists must engage critically with the AIED narrative. Maybe there is positive potential. However, it is essential that the many usually unsubstantiated claims are challenged, that independent evidence at scale of both efficacy and safety is demanded, that the assumption that AIED is inevitable and will only benefit education is questioned, and that teachers working together make the key decisions about the teaching and application of AI in education.



The full research paper can be found via the QR code or by going to: <https://eiie.io/2023AIInEdu>



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