

# Teaching and Learning in an AI-powered world

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## Abstract

In a world where artificial intelligence (AI) is increasingly used, education is undergoing profound transformations, as AI inevitably changes the paradigm of teaching and learning. Teachers have already begun to use AI for student-centred learning, data analysis, or improving assessment through standardized systems provided by AI. Although these new technologies promise efficiency and personalized education, AI is not yet developed enough to truly understand the mechanisms underlying learning. Excessive dependence on technology can reduce the teacher's role and the importance of human interaction, while certain ethical issues may arise regarding data confidentiality and security. To address these challenges, teachers and decision-makers must carefully integrate AI, emphasizing transparency and ethics, to ensure that technology will indeed have a positive impact on society. This article explores the issues and concerns related to the use of AI in education, also examining the potential disadvantages and fears associated with it and providing an overview of the challenges that teachers face when integrating AI into education.

## Keywords:

artificial intelligence; virtual tutors; Intelligent Tutoring Systems;  
Teachers' Perspectives; education; Machine learning.

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In an AI-powered world, teaching and learning go through profound transformations. Educators put artificial intelligence to work in order to obtain personalised learning experiences, that will suit more learning styles. AI algorithms analyse data in order to identify not only students' strengths but also areas that can be improved. Virtual tutors were created in the first place to provide students with tailored courses and more accurate assessments. However, there are still issues connected to data privacy, algorithmic biases, and students' development of critical thinking even if proponents of using AI in education consider that it could improve learning outcomes and equip students with the skills needed for success in the 21<sup>st</sup> century if approached wisely and cautiously ([Kamalov, David Santandreu and Ikhlās 2023](#), 1). In this respect, the role of teachers and educators is still crucial at certain training stages ([Wollny \*et al.\* 2021](#), 1; [Szymkowiak \*et al.\* 2021](#), 1-2).

In today's world, both students and teachers need to understand and use computer programs and different AI-powered tools. This knowledge will help people become more familiar with a technology that will usher them into a future society where people and artificial intelligence will have to cooperate. In theory, teachers who become familiar with AI technology will be able to provide students with scientifically better and more tailored lessons, while students will boost their academic performance and will be more prepared to thrive in a world that will more certainly become more different from ours. Cultivating scientific literacy in education will thus ensure that future generations are better prepared to tackle the challenges of the modern world with the help of knowledge, confidence, and a critical mindset ([Kilag \*et al.\* 2024](#), 314-315).

## Concerns and Challenges

For the general population, artificial intelligence remains a largely unexplored field. The media often mention AI in the context of job loss, increased mass surveillance, and other social issues, so it is not surprising that people primarily associate AI with these problems, without fully understanding its technical and academic aspects ([Frey and Osborne 2017](#), 254-255) When people use AI, or what they believe to be AI, their interaction is more complex than it seems. Consequently, the way people relate to AI tends to gradually change due to improved terminology, and as AI development occurs within a broader social and cultural context, the technology also evolves accordingly. Therefore, social debates and changes in AI usage patterns are extremely important because they influence researchers' perspectives and, as a result, are reflected in the public aspects of AI ([Campion \*et al.\* 2020](#), 463-468; [Schaich Borg 2021](#)).

Dwivedi ([Dwivedi \*et al.\* 2019](#), 64-65) draws attention to the multiple issues related to the use of AI, suggesting that the technology must be carefully controlled to ensure its benefits are maximized and risks mitigated. In this context, it is necessary to establish

responsibilities for the proper functioning and development of new technologies, especially as this technology becomes increasingly powerful. However, since many departments and organizations are involved in AI development, their programs often overlap to some extent. Consequently, this ambiguity can lead to situations where there is uncertainty about who is responsible for their proper functioning and preventing errors. The use of interactive AI technologies will undoubtedly require more oversight and regulation, while researchers will need ethical guidelines and companies will have to function within legal frameworks to navigate and even shape economic and cultural landscapes (Campion *et al.* 2020, 3-8).

In the case of AI-assisted learning, it is difficult to say how much young people will be affected by the lack of human communication and whether AI tutors will have the ability to understand and respond to their emotional needs. In the relationship that develops between teacher and student during teaching sessions, teachers play a very important role by providing emotional support, motivation, and a sense of belonging to a learning community. Replacing human teachers with AI systems will impact students' emotional development, and this is another area that needs to be investigated.

In addition, people usually try to work in groups with their peers to solve issues or test out new concepts. The process of collaborative learning typically entails creating group knowledge that can be applied to specific problems. In theory, the effectiveness of the group would be considerably increased by the use of IA which could both add to and learn from this collective knowledge. This would be especially true if the community's common solutions could be improved, resulting in quicker advancement. Still, in group-based learning, students alternatively assume the roles of teacher and learner, and their skills can be successfully utilized in a context where they serve as resources for their peers, explaining concepts and asking clarification questions, promoting respect and openness in discussions (Hussein 2021, 15-17).

However, specialized intelligent tutoring software can be designed to discover how much students know, and when their knowledge should be extended or revised. Analysis of a network of students' knowledge can reveal the salient misconceptions and differences in approaches, as well as those learners who are particularly far ahead or behind their classmates (Phillips *et al.* 2020, 1430-1437). According to Kim (Kim *et al.* 2022, 79), a randomized controlled trial in tutoring services indicates that when tutors adapt to students' learning needs using AI-generated diagnoses, there is a significant improvement in academic performance. Still, the authors observe that some tutors show resistance to AI and struggle with issues like technology overload, which can limit AI's effectiveness on service outcomes. Since AI can be widely applied in various service marketing contexts, the authors recommend that firms should focus on overcoming the challenges employees face in using AI, rather than just promoting its use as it is (Kim *et al.* 2022, 80).

Mousavinasab ([Mousavinasab et al. 2018](#), 142-163) investigates multiple dimensions of Intelligent Tutoring Systems (ITSs), such as educational fields, applied AI techniques, AI objectives, learner characteristics, evaluation methods, and user interfaces, stating that adaptive learning in ITSs, which influences learners' knowledge and performance, is increasingly widespread across various educational disciplines even if ITSs are seldom utilized in experimental courses that focus on problem-solving and decision-making.

Although AI is hugely powerful, it raises important questions that need to be investigated, both in general but also in a specific context such as learning, for example, those concerning the ethics of automation. While these algorithms can analyse vast amounts of data, they may struggle to capture the nuances of human learning and emotion accurately. But learning involves more than just data points; it also entails intricate relationships, human ingenuity, and social dynamics, all of which AI might find difficult to completely understand. Concerning the effect of growing automation and artificial intelligence on human activities, there are also numerous pertinent questions. For instance, should people always make all decisions? Is it appropriate to assign important jobs to machines? Additionally, ethical issues are relevant, especially when it comes to government and education. They include how to create decision-making and control procedures for investments and advancements in international artificial intelligence systems, how to get future employees ready, and how to effectively address these challenges and benefit from AI advancements ([McKendrick and Thurai 2022](#)).

These queries have many implications for algorithm designers, for those who promote the use of AI in learning contexts, and for teachers who deal with the various issues to be studied, as well as induce more than a little apprehension, particularly when recent reports also highlight some of the risks associated with the spread of AI. For instance, Galaz ([Galaz et al. 2021](#), 1-2) identifies several potential systemic risks in these domains, including algorithmic biases, which can lead to unfair outcomes and discrimination. Unequal access and benefits pose another risk, as disparities in technology availability can exacerbate existing inequalities. Cascading failures and external disruptions highlight the vulnerability of interconnected systems to widespread breakdowns and external shocks. Additionally, there are compromises between efficiency and resilience, where optimizing for efficiency can reduce the system's ability to withstand and recover from disruptions.

Furthermore, the quality and relevance of the data used are directly connected to the effectiveness of personalized learning provided via AI. The risk here comes from the fact that the education system will rely too much on technology, thus reducing the role of educators and human interaction in the learning process with results that cannot be predicted accurately at the moment. Furthermore, worries about data security and privacy are raised by the use of AI in education ([Galaz et al. 2021](#), 7).

AI systems will collect and analyze student data during the educational process, but there is no guarantee that the data will not be accessed by outside parties and used for their gain, raising concerns about misuse and privacy issues.

However, it is certain that at some point in the future, we will have to live and work with AI as an equal partner, which will also require a new form of governance that will acknowledge the capacity of both humans and computers to efficiently share decision-making. Digital culture cannot be “consumed” as digital culture should be an integral part of the curriculum, whether the student is committed to a scientific or humanistic education. Without access to education that includes knowledge and understanding of how artificial intelligence works, there is no preparation for life in an increasingly technological world. An AI-based technology that is not transparent and is not governed by policies, or one that develops in a framework that does not include the human factor, could end up jeopardizing the future of society and its values ([McKendrick and Thurai 2022](#)).

It is therefore important not only to use AI in education but also to learn about AI, including its benefits and the issues it can generate. Thus, teachers and decision-makers need to approach the integration of AI in education with caution, emphasizing transparency, ethical considerations, and ongoing human oversight to ensure that the technology enhances rather than diminishes the learning experience.

## **AI and Holistic Education**

Holistic education is an approach to learning that focuses on the complete development of a person, including their mind, body, and spirit, beyond academic success. This method addresses all aspects of a student’s life, such as thinking, feelings, social skills, physical health, and creativity. The main goal of holistic education is to develop individuals who are not only good professionals but also emotionally complex. According to Gardner ([Gardner 1993](#), 50-120), human intellectual competence involves the problem-solving ability that allows a person to tackle the challenges they face and, when necessary, achieve efficient results. Additionally, it includes the potential to identify or generate problems, which will pave the way for acquiring new knowledge. These criteria reflect Gardner’s effort to highlight the intellectual elements that are important in a particular cultural context. However, he acknowledges that the elements considered important and valuable can vary greatly from one culture to another, even though the accumulated experience of a person will lead to their overall development.

Gardner ([Gardner 1993](#), 320-400) acknowledges that even the most talented teachers may have difficulty aligning a student’s intellectual profile with educational objectives. In this case, computers can assist by providing the necessary information and offering alternative programs in a very short time. Student’s capacity to learn

at their own pace while using different learning methods is another advantage of including computers in the classroom. Gardner adds that despite these significant benefits, computers cannot replace certain interpersonal responsibilities and may perform worse in some areas than in others, such as kinesthetic or logical-mathematical intelligence. He also draws the attention that the use of computers in other fields might be less effective precisely because of their potential to support only the type of intellect that led to their creation.

According to Dewey ([Dewey 2010](#)), experiential learning is also important because it makes students gain practical skills and a deeper understanding of concepts through hands-on activities and real-world experiences. The goal of education should be to cultivate students' curiosity, critical thinking, and problem-solving skills. He believes that education should be an ongoing experience that takes place outside the classroom and that schools should act as communities where students will not only learn on their own but also collaborate and develop as human beings.

According to Miller ([Miller 1992](#), 9-13), if education is approached from a holistic perspective, it will be more effective because it takes into account the development of multiple distinct qualities. The cyclical and interconnected nature of experiences is also discussed by Clandinin and Connelly ([Clandinin and Connelly 2000](#), 2-5), who believe that each experience is both a result of previous ones and a precursor for what is to come. They see learning and growth as continuous processes in which each experience represents the foundation upon which new learning possibilities, based on prior knowledge, will be built. This perspective shows how personal and academic development is constantly changing and evolving, emphasizing how important it is to reflect on the past to understand present and future actions and decisions. If people base their actions on this constant interaction, they can develop better, as they will not only be the actors in their lives but also the architects behind them.

The holistic aspect of the learning process is best described by Orr's definition of holistic education ([Orr 2005](#), 87-99). According to him, the purpose of holistic education is to educate the whole person and the relationships between the mind, body, emotions, and spirit. Orr emphasizes the importance of addressing the complexity of human existence in the educational context, stating that holistic education can take the form of a more comprehensive and meaningful learning experience as it takes into account the spiritual and emotional elements in addition to the academic and physical ones.

In this context, teachers fear that AI-driven learning will prioritize data analysis over the overall development of students. This concern arises because the more elusive aspects of education, such as social-emotional learning and critical thinking skills, are almost impossible for AI algorithms to understand and address, at least for the time being, even though their efficiency allows them to process huge amount of data to identify patterns and make recommendations.

## Social-emotional learning

Social-emotional learning (SEL) includes a variety of skills necessary for personal development and academic success. SEL will develop students' communication skills together with the capacity to make responsible decisions that will finally assist them in building solid connections with others, controlling their emotions and dealing with different situations that might arise.

Given that social values cannot be yet included in the design of AI tutors, there is some reason for concern that AI-driven tailored instruction may face major challenges in addressing students' social-emotional needs (Dwivedi *et al.* 2019, 65). The main uses of AI personalized software seem to focus more on computer science education, medical, and mathematics fields than on other fields (Mousavinasab *et al.* 2018, 16-17). Without human guidance and interaction, students may miss out on nuanced feedback, emotional support, and empathetic understanding.

Therefore, even in the context of using AI tutors, students should learn about empathy, practice their communication skills, and develop their decision-making abilities, although this approach requires a variety of activities. Here are some of the methods:

- **Simulations and role-playing**

Students will learn to see things from different perspectives by joining role-playing games or simulations. This approach will develop empathy and understanding of other people's thoughts, emotions, and experiences. (Wheeler 2006, 332-343).

- **Group Discussions and Cooperative Learning**

This activity will give learners the chance to work on group projects and take part in group discussions in which to share their ideas and cooperate. The result will be improving their communication skills and building interpersonal relationships that require mutual respect and teamwork (Gillies 2016, 42-43).

- **Journaling and Reflection**

Teachers should encourage students to keep a journal or participate in reflection activities because students who often analyse their ideas, emotions, and experiences understand better who they are—their strengths and faults included. Participation in this type of activity can lead to more conscious personal growth (Dorit, Raichel and Naamati-Schneider 2022, 3-5).

- **Problem-solving and Decision-making Activities**

Students are given scenarios where they have to make choices, such as case studies or problem-solving tasks. These exercises will help them think critically and discover the impact of their decisions. By working with real-life scenarios, students can learn how to handle complicated situations better. (Adair 2007, 62-72).

- **Peer Mentoring and Support**

Learners will attend peer mentoring programs so that older students can help and support younger ones. This will help them become more empathetic and improve their communication skills in addition to building a community

where they can learn and support each other while forming strong connections (Glaser, Hall and Halperin 2006, 5-8).

- **Social-emotional Learning Programs**

Social-emotional learning (SEL) programs will be included to teach and reinforce skills like empathy, communication, self-awareness, and making responsible choices. Learning environments that prioritize students' emotional and social well-being can be created via SEL programs (Lawson *et al.* 2019, 2-3).

- **Critical Thinking**

AI algorithms come with capabilities, recommendations, and feedback through data analysis (Chen, Chen și Lin 2020, 75269) even though they may be limited in the type of guidance they provide compared to human teachers. Artificial intelligence does not understand human interaction and cannot create an environment where students feel safe to take risks, make mistakes, and generally express themselves freely. Teachers encourage students to push the boundaries of their knowledge and abilities through continuous learning. Through guidance and interactive teaching techniques, they can contribute to the development of students' critical thinking. Teachers promote analytical skills and independent thinking through specific questioning, group projects, and situations that involve solving current problems.

Additionally, critical thinking is not a static process, as it develops through practice, feedback, and observation (Halpern 2014, 7). AI systems operate based on predefined rules and patterns derived from previous data, which is why they cannot fully comprehend the complexity and unpredictability that characterize critical thinking. Given this, AI will struggle to identify relevant data, adapt to new or unfamiliar situations, or make complex decisions that require contextual knowledge because critical thinking often includes subjective components, such as problem-solving, drawing conclusions, and decision-making (Halpern 2014, 8). Emotional intelligence and ethical issues are also difficult for AI algorithms to understand. All these aspects of human thinking are embedded in personal beliefs, cultural norms, and social contexts, making them hard to quantify in a way that AI can understand and replicate.

## What do teachers fear?

In essence, teachers' apprehension towards AI-driven personalized learning stems from the concern that it may prioritize quantifiable outcomes, such as test scores or academic achievements, to the detriment of holistic education. Teachers worry that focusing too much on numbers and test scores can lead to a narrower curriculum, less attention to students' social and emotional needs, and a drop in their ability to handle difficult problems. While AI systems can help with specific tasks, their algorithms might not fully capture the diversity and complexity of human interactions and experiences (Dwivedi *et al.* 2019, 76; Kamalov, David Santandreu and Ikhlaas 2023, 12).



The analysis conducted by Sulmont ([Sulmont, Patitsas and Cooperstock 2019](#)) focuses on the pedagogical knowledge needed to teach machine learning to students who lack a background in computer science. According to his findings, students have vague information about machine learning, do not fully understand the real mechanisms behind it, and as a result, face numerous issues in using AI. To overcome such barriers, educators need to adopt various strategies, such as using specific datasets, modelling and teaching algorithms in the classroom, as well as presenting open-ended, domain-specific questions with practical applicability.

Others believe that the interaction between humans and AI may pose issues even outside the classroom. To address the challenges related to human-AI collaboration, several research directions have been proposed. Firstly, Dwivedi ([Dwivedi \*et al.\* 2019, 24](#)) argues that empirical research is needed to investigate decision-making processes regarding task automation and the appropriate level of AI-based automation, given that the scope of its application will expand as AI becomes more sophisticated. A second priority according to Dwivedi is to understand the factors leading to increased human reliance on AI-based automation and, consequently, to establish countermeasures. As artificial intelligence is used in more domains, the risk of humans favouring AI recommendations over their own judgment increases, leading to reduced situational awareness. A third research priority is examining how human workers can effectively mitigate AI errors or failures, especially in high-risk automation scenarios. Therefore, further research is needed to demonstrate how human workers can be trained to anticipate problems and understand AI logic, thus ensuring transparency in decision-making for fault diagnosis ([Dwivedi \*et al.\* 2019, 25](#)).

Furthermore, teachers are also concerned about the potential loss of autonomy and authority in the classroom if algorithm-driven curricular selections and teaching approaches are used. This concern derives from a fear that educators' roles will be reduced to those of mere facilitators, devoid of the nuanced professional judgment and creativity that they offer to the teaching profession. The essence of teaching does not lie only in the delivery of content but also in the ability to customize education in order to suit students' needs and interests. Teachers fear that AI-driven approaches might undermine their autonomy to make pedagogical decisions based on their expertise and insights into their students' particular learning styles. The concern also refers to the risk of standardizing teaching practices in case AI algorithms replace creative teaching methods that are unique to each classroom and student population ([Kamalov, David Santandreu and Ikhlaas 2023, 20-21](#)) Teachers' sense of professional identity and satisfaction are undermined by this lack of autonomy, which makes it harder for them to motivate students.

AI algorithms harvesting massive volumes of student data creates substantial ethical concerns regarding who has access to them, and how they are stored and utilized. ([Kamalov, David Santandreu and Ikhlaas 2023, 18-19](#)). These data include sensitive information on students' academic performance, behaviour, and even personal

information, which can be used wrongly if not properly secured. Ensuring effective data protection mechanisms, such as encryption and rigorous access limits, is critical to preventing abuse and that is why, clear laws and regulations must be implemented to control the gathering, storage, and use of educational data to ensure transparency and accountability (Prinsloo, Sharon Slade and Khalil 2022, 876-878)

Annabel Lindner's study (Lindner and Romeike 2019, 24-26) has identified some key factors that have an impact on teachers' perspectives on the use of AI in the classroom. The influence of social discourses surrounding AI on instructors' content understanding is one of the main causes. Public narratives and media portrayals also have a great impact on these perceptions, thus resulting in a mixture of anxiety and optimism. AI is considered a useful tool by a part of educators who hope that it will help streamline administrative processes and improve personal learning. Others worry that it may reduce the human element of teaching or even result in job displacement. Actually, the larger social discussion over the function and implications of artificial intelligence is reflected in this dichotomy.

Additionally, Lindner and Romeike (Lindner and Romeike 2019, 25-27) emphasize that most teachers have not used AI in their teaching process and that their knowledge of this technology is purely theoretical, which exacerbates their concerns and uncertainties. Without direct experience, teachers cannot anticipate how AI could be integrated into their teaching practices. Due to this lack of experience, it is clear that teachers need training programs that provide a deeper understanding of the advantages and disadvantages of AI and offer opportunities to experiment with its tools in various educational contexts. Addressing various educational goals through AI-tailored teaching concepts can help bridge this gap, resulting in teachers who are better prepared to use AI to improve learning outcomes and support diverse educational objectives.

## Conclusion

Currently, AI technologies are viewed by most educators either as a blessing or as a source of concern. They worry that AI-based tools could impact the standard of instruction, and student autonomy, and might raise moral issues related to data security and privacy. In light of these concerns, data protection and privacy policies must become a priority, and student privacy must be safeguarded against the risks associated with AI technologies. Another issue is that AI-driven learning may put standardized testing procedures above developing creativity and independent thought. In this context, students' overall development will face the risk of being neglected, a situation which may leave them unprepared to face the difficulties of the modern world.

Nevertheless, AI is already being used in many fields, so it is the responsibility of teachers to make it work for their benefit. It is also important to understand that,

used with caution, at least for the time being, AI could enhance educational methods, even if it will not completely replace them.

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