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Artificial Intelligence as a Teaching and Pedagogical Tool

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Abstract: Artificial Intelligence (AI) is reshaping education by introducing innovative tools that enhance and personalize learning. This transformation not only influences how students acquire knowledge but also redefines the role of educators and the learning environment itself. AI, broadly defined as systems that mimic human intelligence, manifests in various educational applications, such as chatbots for student support, data-driven learning analytics, and machine learning for predictive interventions. AI-driven learning analytics can identify at-risk students, optimize course design, and improve learning outcomes. Additionally, conversational agents enhance interactivity, while blockchain ensures secure certification for online courses. However, AI's effectiveness in education depends on its pedagogical integration. Teaching strategies must align with AI advancements to foster sustainable, inclusive, and accessible learning environments. European and national strategies emphasize the need to integrate AI education into curricula and invest in teacher training. Ultimately, AI offers significant potential to improve education, but its success relies on responsible implementation guided by pedagogical principles. This article explores how AI can transform teaching and learning while ensuring that technological advancements align with educational goals.

Keywords: Educational Technology; Innovative Learning; Pedagogy.

1. Introduction

Artificial intelligence (AI) is fundamentally transforming the educational landscape, introducing innovative tools and techniques that can enrich and personalize the learning experience (Ranieri, 2024). This digital revolution is not only changing the way students acquire knowledge, but is also redefining the role of teachers and the very structure of the learning environment. To contextualize what we are talking about, we must try to define what Artificial Intelligence is. Knowing, however, that the scientific literature has not yet reached an unambiguous definition. This is due to the fact that it is a rapidly evolving field, which takes the form of very different solutions and is made possible by other disciplines such as computer science and data science, as well as often involving complex subfields such as machine learning and deep learning (Fiorucci & Bevilacqua, 2024).

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A framework of reference is that contained in the European Union Strategy for Artificial Intelligence (Marchetti & Casonato, 2021) which defines AI as those "Systems that exhibit intelligent behavior in analyzing their environment and taking actions, with a certain degree of autonomy, to achieve specific goals. Artificial Intelligence-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, voice and facial recognition systems) or they can be incorporated into hardware devices".

The purpose of this contribution is, therefore, to try to answer 2 fundamental questions, namely: "What exactly does it mean to implement AI in teaching and education?" and "What benefits can it bring?"

AI, in simple terms, refers to systems that mimic or simulate human intelligence. In education, this can translate into a range of applications, from the use of chatbots to answer students' questions, to data analysis to track students' progress and personalize their learning journey (Simonetti, 2024).

Another powerful tool offered by AI is machine learning. This technology can be used to analyze data and create inferences that can help improve education. For example, machine learning can help predict when a student might drop out of a course, allowing educators to intervene earlier. As regards benefits, it uses several instruments such as (Barca et al., 2024):

1. The analysis of learning. This technology can help identify students who are likely to be highly motivated, as well as those who may be at risk of dropping out. This information can be used to change the course design and improve the learning experience for all students.
2. Conversational and pedagogical agents, such as chatbots, can be used to interact with students and provide instructional support. These agents can answer students' questions, provide feedback, and help create a more interactive learning environment.
3. Finally, blockchain can be used to provide a certification system for online courses. This technology can ensure that certifications are secure and permanent, making it easier for students to demonstrate their skills and accomplishments.

In short, AI has enormous potential to improve the teaching/learning process. However, to fully exploit this potential, we need to ensure that our teaching strategies and techniques are up to the challenge. Only in this way can we create more sustainable, diverse and accessible learning environments for all students (Nirchi et al., 2025).

It is crucial to emphasize the crucial importance of pedagogy in the context of AI-enhanced education. The value of AI and its positive impact largely depend on how it is implemented and used.

Pedagogy provides the fundamental guidelines for using AI effectively and responsibly in education. Pedagogy reminds us that the goal of education goes far beyond the simple transmission of information. Education aims to develop students' skills, form their values, and prepare them to face real-world challenges. AI can certainly enrich this process, but it is pedagogy that guides its orientation and ensures its quality (Pagliara & Bonavolonta, 2024).

It is for this reason that both the European Commission in the "Action Plan for Digital Education (2021-2027) (Pedone, 2021) and the Italian Strategy for Artificial Intelligence (Crisci, S. 2020), published by the Ministry of Economic Development, have highlighted the need to "Redesign the curriculum of schools so that it includes

learning in the field of Artificial Intelligence and data and to provide investments to encourage the updating of students' and students' skills teaching staff".

AI can be integrated into teaching in many ways, for example through the use of online learning platforms, educational games, or intelligent tutoring systems. The important thing is that the use of AI is always guided by pedagogical and didactic considerations.

2. How can pedagogy and teaching benefit from Artificial Intelligence?

We are living in an era of transformation in education, and one of the catalysts for this change is AI. AI is increasingly integrating itself into the educational process, reformulating the methodologies and skills needed to teach and learn (Moriggi & Pireddu, 2025; Alsolami, 2025). Student education about AI needs to be comprehensive and diverse. Not only should they have a technical knowledge of this tool, but they should also be able to place it in a broader context (McDonald et al., 2025).

To fully understand this evolution, it is crucial to analyze how AI can be a valuable support for educators and a means to improve student learning. Its applications are many (Akgun & Greenhow, 2022):

1. Personalization of learning AI allows you to analyze data related to students, identifying their learning styles, strengths and difficulties. Thanks to this data, it is possible to adapt the content and pace of teaching for each student, thus improving the performance and effectiveness of learning.
2. Support in decision-making. Advanced AI algorithms process large amounts of data in real time, providing educators with valuable information to optimize teaching methods, monitor student progress, and intervene promptly in case of difficulties.
3. Inclusion and assistance for disabilities AI is a fundamental resource for school inclusion. Through tools such as speech recognition, speech synthesizers, and automatic translators, students with disabilities can overcome many barriers, making education more accessible.
4. Access to new educational resources. AI enables the development of virtual assistants and educational chatbots, which offer students immediate answers to questions and concerns. This promotes autonomous and continuous learning, extending educational possibilities beyond school hours.
5. Organization of lessons and time management. With the ability to analyze complex data, AI helps teachers better organize lessons, schedule teaching activities, and create personalized learning paths, improving teaching effectiveness.
6. Innovative teaching. Augmented reality, interactive simulations, and virtual assistants are transforming the way subjects such as math, science, and languages are taught, making learning more engaging and hands-on.

However, despite these challenging advances, it is vital not to forget that AI cannot and should not replace the fundamental role of the teacher (Huang et al., 2021). Educators have an irreplaceable role in guiding students, contributing to their global education. The intersection of education, pedagogy and artificial intelligence offers many opportunities, but it also presents some risks and dangers (Chiu, 2021), including:

1. Dependence on technology: Excessive use of technology can lead to an over-reliance on it, reducing students' ability to think critically and independently.
2. Data privacy and security: AI-powered learning platforms collect a wealth of data about students. This raises concerns about data privacy and security. If not handled properly, this data could fall into the wrong hands or be used inappropriately.
3. Equity in access: Not all students have the same access to technology. This can create a digital divide, with some students having access to AI-enhanced learning resources, while others do not.
4. Teacher replacement: There is a risk that AI could be seen as a substitute for the teacher, rather than as a tool to improve teaching. Teachers play a crucial role in education, providing guidance, emotional support, and a human context that AI cannot replicate.
5. AI ethics: The use of AI in education also raises ethical questions. For example, how should it be used to assess students? What decisions should be made by technology and which should be made by humans?
6. Quality of learning: There is a risk that AI could lead to superficial learning, rather than deep understanding. This technology can be very effective at providing immediate, personalized feedback, but it may not be able to promote critical thinking and deep reflection.

3. The Role of the Teacher in the Age of AI

While AI-based tools are revolutionizing teaching and learning methods, the role of the teacher remains irreplaceable, evolving in increasingly complex and strategic directions (Alam, 2021).

Artificial Intelligence has therefore proved to be a powerful ally for teachers, offering tools capable of personalizing learning, analyzing student progress and proposing targeted content. AI-based educational platforms allow the teaching material to be adapted to the needs of each student, identifying gaps and strengths in real time. This allows teachers to focus more on individual support and student motivation, rather than spending too much time on repetitive tasks such as correcting assignments or grading standardized tests (Huang, 2021).

Despite technological advances, the role of the teacher cannot be reduced to a mere transmission of knowledge. Education is a process that goes beyond simply acquiring information. Teachers are key figures in stimulating curiosity, establishing an empathetic relationship with students and transmitting values such as collaboration, resilience and ethics.

However, AI, as sophisticated as it is, cannot replace human interaction, the ability to inspire and understand the emotional nuances of a pupil. Software can suggest personalized exercises, but only a teacher can grasp a student's emotional difficulties and intervene with sensitivity and humanity. Teaching is not just a matter of transferring information: it is a human process, involving empathy, relationship, and listening (Schiff, 2021).

If in the past the teacher was seen mainly as a transmitter of knowledge, today his function has expanded and enriched. Immediate access to massive amounts of information has reduced the importance of simple memorization, making the ability to interpret, analyze, and apply content critically and creatively essential.

Teachers do not only provide knowledge, but play an irreplaceable role in the education of students, helping them to develop skills that are fundamental for the modern world. Among these, critical thinking, emotional intelligence, creativity and

problem-solving, as well as the promotion of ethical and social values, are key aspects that no machine can teach authentically (Xia et al., 2022).

Cultivate critical thinking. In a world where information is easily accessible, the real value no longer lies in the ability to remember data and notions, but in knowing how to interpret, evaluate and contextualize them. The spread of the internet and social media has made information ubiquitous, but it has also multiplied the risk of running into fake or distorted news (Ng et al., 2024). In this scenario, the teacher has the crucial task of guiding students in the development of critical thinking, helping them to distinguish between reliable sources and fake news, to recognize any manipulations and to build opinions based on verified data. Critical thinking education is not limited to teaching how to verify sources, but extends to the ability to ask questions, question information and evaluate it with an analytical approach. A good teacher does not provide ready-made answers, but stimulates students' curiosity, encourages them to formulate hypotheses, compare different points of view, and develop an investigative attitude toward knowledge (Almasri, 2024).

Develop emotional intelligence. Artificial Intelligence can analyze data, suggest personalized content, and even interact with students through educational chatbots, but it cannot replace empathy, sensitivity, and the ability to understand human emotions. The teacher, on the other hand, has a fundamental role in supporting the emotional growth of students, helping them to develop self-awareness, emotional management and interpersonal skills. In the school context, pupils go through moments of difficulty, insecurity and frustration (Sperling et al., 2024). A good teacher is able to recognize these moods, offer encouragement and support, and create a positive and motivating learning environment. The human relationship between teacher and student is not only a secondary aspect of the educational process, but a central element for personal growth. In addition, emotional intelligence is essential for students' professional and social lives. The teacher, through example and interaction, helps young people to develop empathy, collaboration and conflict management skills, skills that will be decisive for their future, regardless of the sector in which they choose to work (Sanusi et al., 2024).

Encourage creativity and problem-solving. Education should not be limited to teaching predefined concepts, but should stimulate students' ability to imagine innovative solutions and approach complex problems with flexibility and inventiveness. Creativity is not an innate gift of a few individuals, but a skill that can be cultivated through a stimulating learning environment (Celik et al., 2022). Teachers play a crucial role in fostering creativity, encouraging students to think outside the box, experiment with new ideas without fear of making mistakes, and develop a proactive approach to problem-solving. Through practical activities, open discussions, group work and intellectual challenges, teachers can help students to enhance their spirit of initiative and the ability to face difficulties with determination. Problem-solving, in particular, is a fundamental skill for the world of work and for everyday life. While machines can perform predefined tasks efficiently, the human ability to deal with unexpected situations, connect seemingly distant concepts, and find creative solutions remains a hallmark that AI cannot replicate (Lindner et al., 2019).

Promote ethical and social values. Education is not only about the acquisition of technical knowledge, but also about the formation of citizens who are aware, responsible and capable of contributing to the common good (Lameras & Arnab, 2021). Teachers are tasked with transmitting fundamental values such as respect, solidarity, justice and inclusion, helping students to develop a sense of belonging to the community and a critical conscience towards the social and ethical challenges of the contemporary world. In an era marked by inequality, conflict and global change,

education in values becomes more important than ever. Teachers can raise students' awareness of crucial issues such as environmental sustainability, human rights, cultural diversity and digital ethics, preparing the new generations to face the future with awareness and responsibility (Vlasova et al., 2019). AI can be a useful tool for disseminating information, but it lacks the ability to teach the value of collaboration, empathy, and mutual respect. Only a flesh-and-blood teacher can convey these principles authentically, through dialogue, example and direct interaction with students.

4. Digital Competence as the Foundation of the New Teaching

To better face this new era, teachers need to acquire advanced digital skills. It's not just about learning how to use technological tools, but about developing a mindset that is open to innovation and continuous learning. It is essential that teachers know how to effectively integrate AI into lessons, without losing sight of the value of the pedagogical method and direct interaction with students (Al Darayseh, 2023).

In addition, the role of the teacher is increasingly shifting towards that of a learning mediator, a facilitator who helps students navigate a world rich in information, stimuli and digital tools. With the large amount of data available online, it becomes crucial to teach students to distinguish reliable sources from unreliable ones, developing critical thinking and analytical skills (Mandal, 2024).

The advent of Artificial Intelligence does not make the teacher less important, but it challenges him to evolve and acquire new skills. In particular, today it is essential that teachers:

1. Develop advanced digital skills: to best integrate AI tools into teaching, teachers must know and know how to use new technologies, without becoming dependent on them.
2. They are facilitators of learning: the role of the teacher is no longer just to convey information, but to create stimulating and interactive learning environments, fostering collaboration and critical thinking.
3. Stay up to date on new educational challenges: technology advances rapidly and with it the needs of students change. It is essential that teachers continue to train themselves to understand how to improve teaching methods and adapt to new contexts.
4. Guide students to the conscious use of AI: pupils must learn not only to use technological tools, but also to understand their limitations and risks, developing a critical awareness of the ethical and social implications of AI.

Among the essential digital skills for a teacher in the modern era we find (Ismail et al., 2024):

1. Knowledge and use of e-learning platforms: tools such as Google Classroom, Moodle and Microsoft Teams allow you to create digital learning environments, where students can access teaching materials, carry out interactive exercises and participate in online discussions.
2. Use of multimedia tools: traditional teaching can be enriched with videos, podcasts, simulations and augmented reality to improve students' understanding and interest.

3. Inclusive teaching and accessibility: digital technologies can foster more equitable learning by offering support tools for students with learning difficulties, such as text-to-speech software or interactive concept maps.
4. Cybersecurity and digital awareness: It is crucial for teachers to teach students how to surf the web safely, protecting their data and recognizing the dangers of cyberbullying and misinformation.

Therefore, a teacher in the digital age must always be ready to evolve. Technologies change rapidly and with them educational needs. For this reason, continuous training is an essential requirement. Teachers must:

1. Keep up to date: Participate in training courses, webinars, and workshops to keep up with new teaching methodologies.
2. Experiment with new teaching strategies: don't be afraid to innovate and test new approaches to improve learning.
3. Be flexible and open to change: know how to adapt to new technologies, tools and teaching methods.

5. The Need for Continuing Education in the Digital Age

Continuous teacher education in the digital age is one of the keys to ensuring that teaching staff are able to meet the challenges of a rapidly evolving education system (Arslankara & Usta, 2024). With the advancement of technologies and the change in learning methods, it is essential that teachers are constantly updated, not only on disciplinary content, but also on teaching methodologies and digital tools that can enhance educational effectiveness. The world of technology is constantly evolving, and education cannot afford to be left behind. The introduction of digital tools, the use of online platforms and the growing importance of personalised learning require teachers' skills to be constantly updated. In such a dynamic context, continuing education becomes an obligation, not only to remain competitive, but to effectively address the needs of students (Rawas, 2024).

Continuous training for teachers in the digital age is not only about acquiring new technologies, but also includes understanding the changes in students' behaviours and learning methods, which are affected by digitalisation. Teachers must be prepared to deal with new types of interaction with their pupils, using digital tools for classroom management, feedback and progress monitoring.

Today, teacher training is not limited to formal academic courses or in-person seminars. Technology offers numerous opportunities for flexible and accessible learning. Some of the most widely used tools include (Altinay et al., 2024):

1. Online courses and e-learning platforms: Teachers can access refresher courses through online platforms such as Coursera, edX, and education-specific platforms such as Moodle. These courses cover a wide range of topics, from the use of technological tools in the classroom, to the management of emotions, up to the design of innovative educational paths.
2. Webinars and video tutorials: Webinars allow teachers to participate in real-time training sessions, interacting with experts and peers, while video tutorials offer hands-on training on how to use certain technologies, software, or educational applications.
3. Communities of practice and professional online networks: Online teacher groups, forums, and social media such as LinkedIn, Facebook, and Twitter allow teachers to exchange ideas, teaching resources, experiences,

and strategies. These spaces for discussion are essential for continuous improvement, as educators can benefit from the expertise of their peers.

4. Coaching and mentoring programs: Many teachers participate in coaching or mentoring programs, where experienced faculty provide personalized support to improve teaching practices and the use of technologies. This type of training allows for practical and immediate updating, as well as being an opportunity to develop a peer support network.
5. Classroom experimentation: Continuous training in the digital age is also nourished by practical experience. Teachers often learn best when they can directly test technological tools in the classroom and reflect on their applications in daily teaching. Using interactive platforms, content creation applications, and student performance assessment software allows students to develop skills through action.

The acquisition of digital skills is not limited to the use of tools, but embraces a series of knowledge and skills that concern the entire educational process (Palenski et al., 2024). Teachers in the digital age need to be able to:

1. Manage e-learning platforms: Knowledge of educational platforms, such as Google Classroom, Microsoft Teams or Moodle, is essential. Being able to organize materials, track student progress, assign assignments, and offer feedback efficiently is a must-have skill.
2. Knowing how to use instructional design software: Tools such as Kahoot, Canva, Padlet, and Prezi allow teachers to create multimedia content, interactive quizzes, and engaging presentations, which can make learning more stimulating.
3. Adopt digital pedagogy: A digital teacher must not only be able to use technology, but also integrate it in a pedagogically sound way. This means designing learning experiences that respond to students' needs, are inclusive, and stimulate creativity and critical thinking.
4. Promote digital citizenship: Teachers must educate students on a conscious and safe use of technologies. This includes understanding the risks related to privacy, online security, and managing your digital information. Ongoing teacher training must include updates on cybersecurity, cyberbullying, and data protection policies.
5. Using Artificial Intelligence in the Classroom: Adopting Artificial Intelligence (AI) can support teachers in monitoring student progress, personalizing learning paths, and creating adaptive learning experiences. Teachers need to learn how to use these technologies to improve the quality of teaching.

A teacher in the digital age must be flexible and ready to adapt to change. The speed at which technology evolves means that it is not enough to acquire skills once and for all, but that learning must be continuous. This implies a proactive attitude to change and experimentation with new methodologies (Mhlanga, 2023).

The concept of lifelong learning is crucial for teachers, who must be willing to devote time and effort to updating themselves, even in the absence of formal obligations or certifications. Curiosity and the desire to improve one's teaching practices are essential for continuous training.

Continuing education should not be understood as an individual process, but as a collective responsibility. Creating support networks between colleagues is crucial, as it provides an environment for sharing knowledge and best practices. Schools, educational districts and institutions must encourage collaboration between teachers,

creating opportunities for teamwork, mutual mentoring and reflection on teaching experiences (De La Higuera, 2019).

In this context, education is no longer seen as a one-way path, but as a process of mutual learning that involves both teachers and students, in a continuous exchange of experiences and knowledge.

Conclusions

Artificial intelligence (AI) has the potential to revolutionize the educational landscape, transforming traditional teaching methods and improving the learning experience. While AI cannot replace the fundamental human interaction between teachers and students, it offers powerful tools that can support teachers in personalizing teaching, tracking student progress, and adapting content to different needs.

The integration of AI into teaching practices is not limited to the automation of repetitive tasks, but paves the way for a more inclusive, dynamic and accessible education. The use of intelligent platforms, virtual tutors and adaptive applications allows students to progress at their own pace, while teachers can focus more on one-on-one support and managing relationship dynamics in the classroom.

However, the adoption of AI requires adequate preparation and critical reflection. Teachers need to acquire specific skills to use these tools effectively and to ensure that AI is used ethically, respecting student privacy and fostering inclusion. At the same time, it is essential to maintain a balance between technology and the irreplaceable role of the teacher, who remains the emotional, motivational and pedagogical point of reference for students.

Ultimately, artificial intelligence represents an extraordinary resource for improving the quality of education, but its success will depend on the ability to integrate it intelligently and responsibly within an education system that puts people at the center. When used correctly, AI can not only enrich the learning experience, but also help train a generation of students who are more aware, critical, and ready to face the challenges of an increasingly technological world.

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