

Artificial Intelligence and Inclusion: New Perspectives for the Future

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Abstract: Artificial intelligence (AI) is bringing significant transformations to the field of education, opening up new possibilities for school inclusion. Thanks to advanced technologies, AI offers solutions to personalize learning, responding more effectively to the needs of students with special educational needs. AI-based applications can adapt to different learning styles, creating a more inclusive and accessible school environment where every student receives the necessary support. However, the introduction of these technologies also presents challenges. It is essential to develop intelligent systems that are ethical, respect privacy, and avoid discrimination. The mindful use of AI can promote a fairer education system, but only if accompanied by careful monitoring and regulation. In this context, AI has the potential to build a more inclusive school that not only meets the individual needs of students but also promotes an educational culture that values diversity and accessibility for all.

Keywords: artificial intelligence; school inclusion; students.

1. Introduction

Digital technology has become an essential part of our daily lives, to the point where we can no longer separate it from the reality we live in and interact with. In this context, Artificial Intelligence (AI) is playing an increasingly central role (Rivoltella, Rossi, 2024), being at the core of many technological platforms that allow us to carry out a wide range of activities.

Artificial Intelligence refers to the ability of machines to exhibit human-like skills, such as reasoning, learning, planning, and creativity. It is a field of study that explores whether and how it is possible to reproduce complex mental processes using computers. This research develops along two complementary directions: On one hand, AI aims to bring the functioning of computers closer to human cognitive abilities. On the other hand, AI uses computer simulations to make hypotheses about the mechanisms that govern the human mind (Guillot, 2023).

2. Artificial Intelligence (IA) and New Opportunities for Education.

AI took shape in the 1950s and 1960s, with the first programming techniques to create intelligent machines. A pivotal moment in this development was 1950, when



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mathematician Alan Turing published the article *Computing Machinery*, in which he proposed a method for determining when a machine could be considered “intelligent”.

Turing’s interest was not isolated: with the introduction of the first computers after World War II, many scientists began to question whether machines could truly think. Today, artificial intelligence enables systems to understand their environment, interact with what they perceive, solve problems, and take actions to achieve specific goals. The computer receives data (which can be gathered or acquired through sensors, such as cameras), processes it, and responds accordingly (Guillot, 2023).

As mentioned, AI has also made rapid progress in the field of education, becoming a fundamental part of the educational process. In the school context, one of the most well-known examples is the use of ChatGPT (Generative Pretrained Transformer), a natural language processing tool developed by OpenAI, which utilizes advanced machine learning algorithms to generate human-like responses in conversations. ChatGPT was designed to optimize conversation and simplify users’ interaction with technology. This innovation has the potential to transform the way we interact with machines and improve the efficiency of NLP technology. From November 23 to 28, 2022, ChatGPT reached its first million global users. By the end of the same year, users had already grown to 100 million, and by November 2023, there were an estimated 1.7 billion users worldwide. Today, ChatGPT is the most widely used chatbot and is often considered synonymous with AI itself. This scenario is provoking very different reactions across various sectors of public and scientific life, also involving the main experts from tech companies. Among the primary concerns are the fear that humanity could be progressively replaced by machines, anxiety over the incredible learning capacity of AI, which exponentially accelerates its performance, and concerns about labor rights and future employment prospects. Data shows that teachers and students may have found an ideal ally in artificial intelligence to improve the educational process. According to a recent survey by TGM Research for NoPlagio.it, an anti-plagiarism software and AI-generated content detection platform, 65% of Italian students aged 16 to 18 use ChatGPT and similar tools to do homework and write essays. The study involved 1007 Italian students and revealed that the use of AI in schools is now a widespread practice. In addition to the 65% using it for homework and essays, 71% use it to search for information, 60% for exercises, 33% for learning, 18% for answering tests, 21% as a personal assistant, and 13% specifically for writing essays (Ansa, 2024). However, the same sample seems to be aware of the potential ethical issues and calls for more knowledge, awareness, and rules for its use in schools.

In the near future, we will all be managing information generated by AI systems, and the challenge will be to develop the skills to distinguish between reliable and unreliable information. ChatGPT can be considered both a resource and a risk for education. As an educational resource, it offers numerous advantages. Students can use it to get clear explanations of complex concepts, delve deeper into study topics, or even practice foreign languages. With ChatGPT, access to learning becomes broader and more accessible to everyone, allowing the consultation of additional online resources that complement studying. Furthermore, it is a valuable tool for improving writing skills, enabling students to receive immediate feedback on grammar, sentence structure, and content clarity. This type of support allows students to refine their

writing skills independently, without having to wait for a teacher's revision (Cazzanelli, 2024).

However, it is important to emphasize that ChatGPT does not replace the teacher. Education is not limited to the transmission of knowledge but also includes social interaction, collaboration, and the development of communication skills. These fundamental aspects of learning require human contact and cannot be fully replicated by artificial intelligence. ChatGPT must be used with caution, recognizing its limitations, and students should find a balance between using digital resources and traditional teaching, while also developing critical skills that enable them to evaluate and understand information more deeply. When used correctly, artificial intelligence in schools can enhance learning by helping identify and define the strengths and weaknesses of each student. The more the chatbot knows about the student's profile, the better the content personalization will be. AI can also adapt teaching based on individual preferences, creating a customized program that makes lessons more engaging and targeted, responding to students' specific needs.

In the White Paper on Artificial Intelligence for the Service of Citizens, written by the Agency for Digital Italy, it is stated that the use of AI in education could help reduce social inequalities. The document envisions an important role for intelligent tools in supporting learning. Intelligent Tutoring Systems (ITS) are defined as computer tools capable of assisting a student like a human tutor would. These systems use advanced technologies to provide personalized and immediate feedback to students. They function as virtual tutors, adapting explanations and activities to individual needs, supporting students with cognitive difficulties (Maurizio, 2024).

ITS are part of Adaptive Learning Systems (ALS), which guide the student through every phase of the learning process, offering specific suggestions and feedback. The idea of a machine that adapts to the student has existed since the 1950s, but with the advent of new technologies, the possibilities have expanded tremendously. These systems can be used to solve problems, learn concepts, or assess students' skills. Automated Assessment is a system that allows AI to grade tests and assignments, reducing evaluation time. This not only improves efficiency but also provides students with immediate feedback, which is essential for better retention of information and a deeper understanding of the material. Additionally, automated assessment systems ensure greater consistency in evaluation criteria, reducing the risk of errors or subjective biases in manual grading (Rivoltella, Panciroli, 2024). The reliability and accuracy of AI algorithms are critical, especially to avoid input data errors that could negatively impact the educational value of the assessments and advice provided to students. As highlighted by Agenda Digitale, inaccuracies in data or algorithm calculations can lead to irrelevant feedback that risks diverting students' learning inappropriately, away from their actual needs. To avoid these issues, it is crucial to regularly review and update AI models so they can evolve and improve based on increasingly precise and representative data.

The use of Information and Communication Technologies (ICT) with AI will have a positive effect on the development of transversal skills, which are abilities useful in various work and personal contexts. These skills include the ability to communicate effectively, collaborate, think critically and creatively, manage stress, solve problems, as well as demonstrate resilience and leadership. Artificial intelligence can foster the development of these skills by integrating into teaching activities, of-

fering an interactive, personalized, and engaging learning environment that helps students face the challenges of contemporary society and the workforce.

However, concerns still exist, such as those related to privacy and intellectual property. In fact, many large language models are trained on vast databases of text from the Internet without recognizing or compensating the creators. Additionally, there is concern that some companies developing AI may use materials provided by teachers or students' comments for commercial purposes, such as improving their own chatbots.

Despite these issues, artificial intelligence offers powerful tools for education, which can make a significant difference for students and teachers (Floridi, 2022).

3. Artificial Intelligence (AI) for a Quality Education.

The Italian school system operates by following the principles of inclusion, aiming to meet the specific needs of each individual and to value diversity, providing everyone with the necessary resources to develop their potential. The educational system has a moral and legal duty to welcome all students, organizing itself to meet their educational and relational needs, thus promoting inclusion and active participation. As highlighted by Cottini, school inclusion is a complex and multidimensional phenomenon that develops along four interconnected aspects, each of which contributes to creating an inclusive school environment (Ianes, Dell'Anna, 2020). These aspects include the theoretical framework of principles, organization, the necessary methodological-didactic resources, and empirical evidence.

In the context of principles, inclusion is an indispensable value, as it concerns the right of every person, regardless of their condition, to access education in a shared common environment. It is crucial that the school does not see disability as a fixed condition but as the result of an interaction between the individual and the educational environment, an aspect that can be positively modified. This approach is supported by numerous national and international documents that promote the idea of a school that not only welcomes but also values differences, creating an environment that stimulates the growth of every student. Educational opportunities must be guaranteed to all, without distinction, and should not merely be requested but proactively ensured by the educational system. Every student has the right to an adequate and personalized education that meets their needs. In an inclusive context, diversity does not represent an obstacle, but a value that enriches the entire educational environment, promoting individual and collective growth.

True school inclusion is not limited to welcoming but involves a profound transformation of the educational system, which must be designed to meet the needs of all, creating accessible and stimulating learning opportunities for each student. The school must be a place where everyone feels valued, part of a community that promotes solidarity and respect for differences, ensuring everyone the opportunity to grow and develop in a complete and harmonious way. A well-structured, coordinated, and flexible organization is essential for an inclusive educational environment, where all parties involved must collaborate and create synergistic alliances. The concept of an inclusive and accessible context not only concerns the physical structure but also involves the organization of learning processes and relationships. In this sense, the

approach of Design for All represents an important guide, further developing with the application of Universal Design for Learning (UDL) (Leva, 2020).

UDL provides a framework for instructional design and learning processes, promoting the creation of accessible and engaging content. It encourages teachers to reflect on their beliefs regarding the individual differences among students and the various ways each one learns (Raoa et al., 2022). This approach is considered one of the most promising educational strategies to tackle teaching challenges, including valuing diversity, promoting inclusion, and the conscious use of digital technologies, reducing their risks. UDL stands out as an inclusive method because it recognizes the variety of individual student characteristics and promotes diversified teaching approaches, with the aim of valuing the uniqueness of each student, highlighting the importance of emotions for motivation to learn, academic engagement, and educational equity. Through active participation, UDL helps reduce socio-cultural barriers and promotes equal access to educational pathways. Inclusion requires tools and teaching practices that stimulate the active participation of every student, promoting engagement and mutual support relationships. Inclusive education focuses on the participatory management of curricula to encourage the educational success of all students (Leva, 2020). Educational research is essential to assess the effectiveness of the strategies adopted, based on empirical evidence. It is crucial to have valid tools to measure the level of inclusivity in classrooms and schools, also supporting teachers' self-assessment processes. These tools are useful for improving daily practices, promoting critical reflection on the methodologies used, and developing quality indicators for school inclusion (De Luca, Spadafora, Domenici, 2023).

The introduction of artificial intelligence (AI) in the educational field is profoundly altering traditional learning models, making significant progress in the personalization of learning paths and the accurate assessment of students' skills (Baker & Smith, 2014). One of the key innovations of AI is its ability to process vast amounts of data to create highly personalized learning experiences that respond to students' individual capabilities and their personal and professional development goals (Zawacki-Richter et al., 2019). This approach allows overcoming traditional methods, offering students training that adapts to their characteristics, timings, and interests. However, the application of AI in education also brings challenges, many of which concern both practical and ethical aspects.

From a practical standpoint, the adoption of AI technologies requires significant investment in advanced technological infrastructure and effective management of digital resources. Ensuring equitable access to technology for all students, regardless of their socio-economic or geographical conditions, is essential. This is especially important to prevent AI from becoming a source of exclusion rather than an instrument of inclusion. On the ethical side, the use of AI raises crucial questions regarding personal data protection, privacy, and algorithm impartiality (Holmes et al., 2019). It is vital that data be handled with transparency and responsibility, establishing clear rules to avoid discrimination or abuse caused by algorithmic biases. For example, AI-based automatic evaluation systems must be designed to ensure fairness and accessibility. Another key factor for the effectiveness of AI in education is teacher training, as educators must be prepared to use these technologies consciously and effectively. This preparation requires not only technical skills but also a solid understanding of the pedagogical and ethical implications of AI. Teachers need to interpret

data generated by AI systems to improve their teaching, promoting student success without losing sight of the importance of human interaction.

Furthermore, AI holds great potential to promote inclusion and overcome learning barriers. It can support students with disabilities by offering personalized tools that help them actively participate in educational activities and make informed decisions about their future (Fabiano, 2022). Technologies such as voice readers, virtual tutors, and adaptive learning platforms can help bridge educational gaps and promote student autonomy. The integration of AI into education represents a unique opportunity to transform learning processes, making them more equitable, inclusive, and future-oriented. However, to fully harness this potential, a holistic approach is necessary, one that combines technological development, inclusive educational policies, proper teacher training, and an ongoing ethical commitment to ensure that AI remains a tool for the benefit of people, without ever replacing the human interaction that is fundamental in the educational process (Facer & Selwyn, 2021; Perla, 2023). In 1982, Sleeman and Brown coined the term “Intelligent Tutoring Systems” (ITS) to describe software designed to facilitate learning by offering tutorial support that demonstrates a certain level of “intelligence” in its operation. ITS are digital learning environments that use intelligent algorithms to assist students in acquiring knowledge and skills, dynamically adapting to the specific needs of each student during the learning process.

Some of the main advantages include:

- ✓ Continuous availability: they offer support without time limitations, overcoming the typical constraints of human tutors;
- ✓ Reduced pressure on students: they help reduce the fear of making mistakes in interaction with a human tutor, enhancing the learning experience;
- ✓ Personalized activities: they adapt explanations, questions, and practice sessions to the specific needs of the student, optimizing individual learning;
- ✓ Continuous monitoring: they support personalized learning paths by tracking progress and adapting in real-time.

These aspects make ITS a powerful tool for improving education. Recent studies have shown that ITS are just as effective as human tutors in individual teaching, especially in subjects like mathematics or physics, and are significantly more effective than traditional classroom interactions (Trinchero, 2021). Despite their enormous theoretical potential and empirical validation, ITS are not widely used in education and training, primarily due to the complexity and costs associated with creating comprehensive knowledge bases, which are economically sustainable only for courses aimed at large numbers of students, such as military or basic training programs (Ritter et al., 2014).

The current challenge, which will evolve in the future, is to create a machine capable of:

- ✓ Learning a specific topic by interacting with numerous information sources, gathering, comparing, and integrating different perspectives to obtain a comprehensive view of the topic;

- ✓ Accurately identifying students' characteristics, understanding their cognitive, emotional, and motivational aspects in order to design personalized and optimal learning paths;
- ✓ Adapting teaching strategies in real time based on the student's needs, presenting content in various formats, reducing cognitive load, providing targeted feedback, and stimulating motivation and interaction with forms of "social intelligence";
- ✓ Promoting and encouraging collaboration among students, fostering dialogue, co-creation of knowledge, and connecting individual experiences to create a shared and interactive learning environment (Trinchero, 2021).

The integration of robotics with artificial intelligence and the distributed processing of information through high-speed mobile networks can foster the development of advanced intelligent tutoring systems (ITS), which could evolve into interactive tutor robots (ITR). Specific studies indicate that tutor robots are capable of:

- a) Offering personalized interactions with specific users;
- b) Proposing progressive and targeted learning paths;
- c) Leveraging the potential of educational data analysis and data mining. These combined factors improve learning outcomes (Trinchero, 2021; Brignone, Grimaldi, Palmieri, 2021).

ITRs can integrate traditional ITS, adding parasocial interaction and using the surrounding environment and objects as learning support tools. This proves particularly useful for teaching fine motor skills (such as writing), gross motor skills, rehabilitation, and enhancing abilities in people with disabilities. An interesting area of research focuses on the use of ITRs to promote self-regulated learning in children, fostering self-control, goal management, and targeted requests for support.

Research on ITRs is still in its early stages and presents several areas for improvement, including:

- ✓ Recognition of the student's mental states: the ability to detect when the student is focused, motivated, or needs different types of stimuli;
- ✓ Long-term strategic decisions: the difficulty in guiding the student's actions, as a human tutor would, based on a future vision;
- ✓ Personalization of interactions: which depends on the quality of the student model and the ability to adapt dynamically to their progress;
- ✓ Optimization of interaction management during subsequent sessions: the ability to retain and update information about the student, offering distributed practices and revisions of concepts over time (Trinchero, 2021).

In summary, ITRs are robotic systems capable of moving autonomously within defined spaces, such as a classroom during regular educational activities. These robots can learn by observing the teacher and students during their interactions and activities. They can engage in conversations, ask specific questions to explore topics or concepts, and provide enriched responses through quick consultation of online resources

4. Conclusions

The school of the future is envisioned as an environment in constant transformation, highly interconnected, where technological innovation blends with traditional teaching, creating increasingly personalized learning experiences to meet the needs of each individual student. Digital technologies not only fit seamlessly into established educational practices, but they also enhance them, promoting an evolution in the way students learn, explore, and interact with content. In this scenario, the school will not be a rigid space but a dynamic, interactive educational ecosystem where technologies, far from negating the human aspects of teaching, will serve as tools to improve the educational process, making it more inclusive, collaborative, and tailored to individual needs. The constant interaction with the educational environment allows ITRs to better understand learning dynamics, progressively refining their ability to adapt to students' needs and provide targeted, effective support. These systems could become valuable allies for teachers, supporting both the cognitive and motivational aspects, facilitating learning and improving classroom participation. However, the introduction of these technologies raises important privacy and ethical issues regarding the use of advanced technologies in education. Despite the challenges, the integration of these technologies opens numerous opportunities for future research, prompting reflections on how to responsibly incorporate them into the educational landscape.

References

- Brignone, S., et al. (2021). Da ITS a ITR. I social robot come sistemi intelligenti di tutoraggio e di comunicazione, Didamatica, Mondo Digitale.
- De Luca C., Spadafora G., Domenici G. (2023). *Per una inclusione sostenibile*, Anicia.
- Fabiano, A. (2022). Ipotesi per una migliore giustizia sociale. La scuola inclusiva tra didattica digitale e Intelligenza Artificiale. *Formazione & Insegnamento XX – 1 – 2022*, DOI: 10.7346/-fei-XX-01-22_11.
- Facer, K., & Selwyn, N. (2021). Digital technology and the futures of education –towards ‘non-stupid’ optimism. UNESDOC Digital Library.
- Floridi, L. (2022). *Etica dell'intelligenza artificiale*, Raffaello Cortina Editore,
- Guillot, D. J. (2023). *Che cos'è l'intelligenza artificiale e come viene usata. Direzione generale della comunicazione*. Parlamento Europeo.
- Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence In Education: Promises and Implications for Teaching and Learning, Globethics Publications, DOI: 10.58863/20.500.12424/4276068.
- Ianes, D., e Dell'Anna, S. (2020). *Valutare la qualità dell'inclusione scolastica. Un framework ecologico*, in L'integrazione scolastica e sociale Vol. 19, n. 1, febbraio.
- Leva, C., (2020). *La necessaria sinergia tra scuola, famiglia e Sportello Provinciale Autismo per una nuova comunità educante*, I PROBLEMI DELLA PEDAGOGIA. Rivista semestrale diretta da IGNAZIO VOLPICELLI, Anno LXVII Luglio/Dicembre 2020, n. 2, *Autorizzazione del Presidente del Tribunale di Roma n. 4453 del Registro della Stampa 3-2-1955 ISSN: 0032-9347*.
- Maurizio, C. (2024). AI e scuola, arrivano gli assistenti virtuali: ecco le soluzioni per potenziare lo studio. *Agenda Digitale*.

- Perla, L. (2023). Inclusione e IA: linee di lavoro per la ricerca didattica contemporanea, in Per una inclusione sostenibile, a cura di De Luca C., Dominici G., Spadafora G., Ed. Anicia.
- Raoa, K., J., Gravelb, W., Roseb, D. H., and Tucker-Smithc, T. N., a University of Hawai'i at Mānoa, College of Education, Honolulu, HI, United States; b CAST, Wakefield, MA, United States; and c Lessoncast, Baltimore, MD, United States (PDF) Universal Design for Learning in its 3rd decade: a focus on equity, inclusion, and design. Available, <https://dx.doi.org/10.1016/B978-0-12-818630-5.14079-5>. ISBN: 9780128186305.
- Ritter, S., Sinatra, M.A., Fancsali, S.E. (2014). Personalized content in intelligent tutoring systems. Design recommendations for intelligent tutoring systems, in R. Sottolare, A. Grasser, X. Hu, B. Goldberg, (2014). Design Recommendations for Intelligent Tutoring Systems. Volume 2: Instructional Management. U.S. Army Research Laboratory, Memphis.
- Rivoltella, P. C., Rossi P.G. (2024). Tecnologie per l'educazione, seconda edizione. Pearson.
- Rivoltella, P.C., Pancioli, C. (2024). Intelligenza Artificiale ed educazione. Scholè.
- Trincherò, R. (2021). ITS & ITR. I robot come sistemi di tutoraggio intelligente, in Grimaldi R. (2021). La società dei robot (a cura di), Mondadori, Milano.
- Zawacki-Richter, O. et al. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators?, International Journal of Educational Technology in Higher Education 16, DOI: 10.1186/s41239-019-0171-0.

Webography

- https://www.ansa.it/canale_tecnologia/notizie/tecnologia/2024/07/03/il-65-dei-ragazzi-usa-chatgpt-per-studia-re_308e15ba-60f3-49c7-ad14-f223dee467b5.html. Consultato il 14 dicembre 2024
- Cazzanelli, M., ChatGPT: risorsa anche per la scuola?. Sifascuola.it. Consultato il 10 dicembre 2024
- https://www.ansa.it/canale_tecnologia/notizie/tecnologia/2024/07/03/il-65-dei-ragazzi-usa-chatgpt-per-studia-re_308e15ba-60f3-49c7-ad14-f223dee467b5.html. Consultato il 14 dicembre 2024