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# TRANSFORMING THE CLASSROOM: THE IMPACT OF ARTIFICIAL INTELLIGENCE ON EDUCATION

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## ABSTRACT

Artificial intelligence (AI) is transforming education by reconfiguring teaching and learning methods through advanced technologies. This article covers the evolution of the use of AI in education, highlighting its impact on personalizing learning, providing teacher support, and expanding educational accessibility. Examples of implementation in Brazil and around the world are presented, showing how these tools are being applied in different contexts. In addition to the benefits, such as the potential to meet the individual needs of students and optimize administrative tasks, significant challenges are discussed, including inequality of access, technological dependency, and ethical issues related to data use. The article also explores the competencies needed for teachers and students in the age of AI, emphasizing the importance of continuing education for educators and the development of critical and collaborative skills in students. Reflections on the future of AI in education highlight its transformative role, but warn of the need for inclusive public policies, ethical regulations, and investments in infrastructure. In this sense, recommendations are offered for the responsible and inclusive implementation of AI, ensuring that it is an instrument of equity

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and innovation in the educational environment. This study contributes to the understanding of the impacts of AI in education, providing subsidies for institutions and educators to face the challenges and take advantage of the opportunities that these technologies offer.

**Keywords:** Artificial Intelligence. Education. Educational Technology. Teacher Training. Digital Skills.

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## INTRODUCTION

Artificial intelligence (AI) has consolidated itself as one of the most disruptive technologies of the twenty-first century, transforming fundamental sectors such as health, economy, communication and, more recently, education. Its application in educational environments not only redefines the dynamics between teachers and students, but also introduces new possibilities for personalizing learning, promoting accessibility, and optimizing pedagogical processes. This technological revolution, driven by advancing algorithms and the widespread availability of data, paves the way for a more interactive, inclusive, and student-centered classroom.

In the context of contemporary education, the integration of AI has the potential to overcome traditional teaching models, which are often criticized for their homogeneous approach that is not very adaptable to the individual needs of students. AI-powered tools such as intelligent tutoring systems, predictive performance analytics, and adaptive learning platforms demonstrate how technology can be utilized to create more personalized and effective educational experiences. However, the use of these technologies also raises ethical and social questions that deserve attention.

The history of education shows how technological innovation has been a constant over the years. From the introduction of the chalkboard to the emergence of digital platforms, each new tool transforms the way knowledge is disseminated and apprehended. Artificial intelligence, however, has a significant differential: the ability to learn and adapt from data, which exponentially expands its applications. This evolution points to a future in which AI will not only be a support to the teacher, but an active element in the teaching-learning process.

This article aims to analyze the impact of artificial intelligence on education, with an emphasis on its contributions to the transformation of the classroom. Specifically, it seeks to discuss how AI-based tools are being implemented, the benefits they offer, and the challenges associated with their use. The relevance of this study is justified by the growing insertion of technology in everyday school life, which requires critical reflection on its pedagogical, ethical and social implications.

The rationale for addressing this topic is rooted in the need to understand how education can adapt to the demands of an increasingly technologically interconnected world. In a global scenario where competitiveness is directly linked to access and effective use of information, preparing students and teachers to deal with artificial intelligence

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becomes essential. In addition, there is an urgency to ensure that these innovations are accessible and inclusive, promoting equity in the educational environment.

The use of AI also raises questions about the role of the teacher in the modern classroom. While technologies can automate administrative tasks and support learning, they do not replace the importance of the educator as a mediator of knowledge and facilitator of critical thinking. Therefore, it is essential to explore how teachers and students can develop the necessary competencies to fully take advantage of the opportunities offered by artificial intelligence.

Methodologically, this article adopts a bibliographic approach, based on the review of academic literature and case study reports that document the impact of AI on education. The analysis will be guided by theoretical perspectives that discuss both the technological and pedagogical aspects of the use of AI systems. In addition, data on the impact of these technologies in different socioeconomic contexts are considered, in order to offer a broad and balanced view.

The debate on artificial intelligence in education gains even more relevance in a post-pandemic period, in which digital technologies have become indispensable for the continuity of teaching. During the COVID-19 pandemic, many schools and universities have adopted AI-powered solutions to facilitate remote learning and support teachers and students. This historical moment highlighted both the potential and limitations of educational technologies, providing a valuable starting point for future reflections.

In addition to assessing the benefits of AI, this article also addresses the challenges that its implementation poses. Issues such as data privacy, inequality of access, and ethics in the use of autonomous systems are crucial topics that need to be considered. Without a conscious and responsible approach, there is a risk of widening existing disparities and compromising the quality of education.

Therefore, this work seeks to contribute to the academic field by offering a critical and reasoned analysis of the impact of artificial intelligence on education. By exploring the ongoing transformations, it is intended not only to map future possibilities, but also to encourage a reflection on how these technologies can be used to build a more efficient, equitable educational system aligned with the needs of contemporary society.

## THE EVOLUTION OF EDUCATION WITH ARTIFICIAL INTELLIGENCE

The evolution of education is intrinsically linked to the advancement of technologies

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that, over the centuries, have shaped the way knowledge is produced, shared, and assimilated. From the use of manuscripts and the creation of the Gutenberg printing press to the arrival of the internet, each technological innovation has brought significant changes in the educational environment. Currently, artificial intelligence (AI) represents the apex of this transformation, allowing you to personalize learning, predict student difficulties, and automate administrative processes.

With its applications widely explored in various industries, AI has the potential to revolutionize teaching by providing tools to create adaptive and interactive educational experiences. This chapter addresses the historical context of the emergence of artificial intelligence and how its first applications began to impact the educational sector, paving the way for modern practices.

## BRIEF HISTORY OF AI AND ITS INTRODUCTION IN THE EDUCATION SECTOR

The concept of artificial intelligence originated in the 1940s and 1950s, with the pioneering work of Alan Turing, who idealized the ability of machines to perform human-like intelligent operations (Turing, 1950). However, it was in the 1956s, at the Dartmouth conference, that AI was formally recognized as an autonomous field of study, seeking to replicate human behaviors through algorithms and machines (McCarthy et al., 1956).

In the educational sector, the first steps of AI were taken in the 1960s, with the creation of intelligent tutoring systems, such as "SCHOLAR", developed by Carbonell (1970). This system used AI to answer geography questions and personalize content based on student responses, marking the beginning of the use of algorithms to personalize learning.

During the following decades, advances such as the development of neural networks and machine learning techniques expanded the possibilities for applying AI in education. In the 1990s, more advanced systems emerged, such as "ANDES", aimed at teaching physics, which not only provided personalized instructions, but also evaluated performance in real time (VanLehn et al., 2005).

From the 2000s onwards, the expansion of digital connectivity and the increase in computing capacity made it possible to use AI-based tools on a global scale. Learning platforms such as Khan Academy have begun to incorporate adaptive learning algorithms, while academic institutions have implemented data analytics systems to predict dropout rates and suggest personalized pedagogical interventions (Siemens and Long, 2011).

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As a result, AI has been progressively integrated into educational processes, not only as a technical support, but as an ally in the transformation of the classroom. This historical trajectory demonstrates that, since its first applications, AI has sought to solve central challenges in education, such as personalization and accessibility.

## MOST USED TOOLS AND TECHNOLOGIES

With the advancement of artificial intelligence, a wide range of tools and technologies have become an integral part of the educational environment. These tools not only modernize the classroom but also enhance interactions between teachers and students by providing personalized and interactive experiences. In this topic, we will address some of the most used tools and technologies, highlighting their characteristics and implications in the teaching-learning process.

Thus, it is to be understood that the impact of the adoption of artificial intelligence (AI) tools in education transcends the classroom, directly influencing students, teachers, institutions, and society in general. These technologies not only offer practical improvements in learning and teaching, but also have far-reaching implications for educational development, equity, and innovation.

AI allows for highly personalized learning, adapting content to the needs, interests, and pace of each student. This is particularly valuable in inclusive education contexts, where students with different abilities and needs can receive specific support. For example, systems such as Voice Dream Reader facilitate the learning of students with visual impairments or dyslexia, promoting greater equity in access to education.

Adaptive learning platforms such as DreamBox, Knewton, and ALEKS have been widely used in higher and basic education. These technologies use machine learning algorithms to analyze student performance and adjust content according to their specific needs (Johnson et al., 2016). The personalization provided by these tools contributes to increased learning efficiency and reduced knowledge gaps.

Tools such as educational chatbots, including the integration of virtual assistants such as ChatGPT, have gained prominence in classrooms and virtual learning environments. These systems provide real-time support, answering frequently asked questions from students and offering explanations of concepts in an accessible and immediate way. In addition, its use reduces the administrative burden on teachers, who can focus on more strategic activities.

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Intelligent tutoring systems, such as Cognitive Tutor, are widely applied in the teaching of subjects such as mathematics, science, and languages. These systems analyze student responses in real-time, providing personalized feedback and adapting the difficulty level of activities according to the student's progress (VanLehn, 2011). Such systems are particularly effective in promoting active learning and reducing dropout rates.

AI-powered tools also automate administrative tasks such as grading assessments, organizing data, and monitoring student progress. This frees up teachers' time to focus on higher-value pedagogical activities, such as devising teaching strategies and direct interactions with students. In addition, predictive analytics enables the early identification of at-risk students, allowing for proactive interventions.

There are also educational analytics tools, also known as Learning Analytics, which allow institutions and educators to track student progress, identify patterns of behavior, and predict potential academic difficulties. Platforms such as Edmodo and Canvas use data to provide insights that help teachers personalize their teaching strategies (Siemens and Long, 2011).

The use of technologies such as gamification, augmented reality (AR), and virtual reality (VR) transforms the learning experience into something more dynamic and interactive, increasing student engagement and motivation. This translates into greater knowledge retention and, consequently, better academic outcomes (Deterding et al., 2011). Both Augmented Reality (AR) and Virtual Reality (VR) allow you to simulate learning environments and situations. Tools such as Google Expeditions and zSpace provide students with immersive experiences, allowing them to explore complex topics in a visual and practical way. These technologies are particularly effective in areas such as science, medicine, and engineering (Wu *et al.,* 2013).

Gamification is a strategy that uses elements of games to engage and motivate students in learning. Tools such as Kahoot!, Duolingo, and Classcraft transform the educational process into a more dynamic and participatory experience. Studies show that gamification improves information retention and stimulates student interest (Deterding et al., 2011).

However, these innovations also bring significant challenges. The use of sensitive data, such as academic and behavioral performance information, raises ethical issues related to privacy and security. In addition, the effective adoption of these tools depends on the continuous training of teachers, who often face barriers to accessing adequate

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technical and pedagogical training to integrate these technologies into their practices.

The introduction of AI into education also has the potential to transform entire education systems. For example, countries with robust technology infrastructure have reported significant advances in democratizing access to quality education. At the same time, institutions that integrate AI into their processes are better prepared to respond to the demands of the global labor market, forming citizens able to deal with the complexities of the digital economy.

Finally, AI is redefining the role of the teacher and the student, promoting a more collaborative education centered on the development of socio-emotional skills, critical thinking, and problem-solving (Redecker et al., 2011). This transition points to a future in which education becomes a more inclusive, equitable process aligned with the demands of the twenty-first century.

This analysis shows that the contributions of AI to education are not restricted to technical or operational gains. It is a comprehensive transformation that broadens the reach and quality of education, while challenging educators, managers, and policymakers to address ethical and structural issues to maximize the benefits of these technologies.

It is noted, therefore, that the use of these tools and technologies not only facilitates learning, but also democratizes access to education, allowing a greater number of students to achieve better results. However, the effective implementation of these technologies requires adequate teacher training, as well as significant investments in infrastructure.

## EXAMPLES OF IMPLEMENTATION IN BRAZIL AND IN THE WORLD

Artificial intelligence (AI) has established itself as an essential tool in education, being used in different contexts around the world. This topic analyzes concrete examples of AI implementation in education systems, highlighting its applications, impacts, and challenges.

In Brazil, the integration of artificial intelligence in education is still at an early stage compared to more developed countries, but significant advances have been observed. Some initiatives deserve to be highlighted:

Tools such as Geekie One have been widely used by private educational institutions in Brazil. This platform combines adaptive learning algorithms with personalized curriculum content, helping teachers monitor student progress and identify gaps in learning (Geekie, 2020). This solution has been praised for its customization potential, but faces limitations

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related to accessibility in public schools due to its high cost.

In the public sphere, the Connected Education program uses analytical data to monitor the impact of educational policies. Through technological tools, the federal government has sought to map school performance on a large scale and propose specific interventions for regions with low performance (Brasil, 2017).

On the global stage, the adoption of artificial intelligence in education is broader and more diverse, with several countries leading innovative initiatives.

In the United States, higher education institutions, such as Carnegie Mellon University, have implemented Cognitive Tutor to assist in the teaching of mathematics and science. This system, based on AI, adapts lessons to the student's pace, providing real-time feedback and reducing failure rates (VanLehn, 2011).

China is a pioneer in applying AI for large-scale personalization. Platforms like Squirrel AI utilize advanced algorithms to deliver self-paced learning experiences to millions of students. This tool has been applied both in public schools and in extracurricular programs, and is considered a model of efficiency in the use of AI to improve academic performance (MIT Technology Review, 2019).

In India, Byju's platform uses AI to offer online classes to millions of students, including those in rural regions and without access to quality schools. With algorithms that analyze individual performance, the platform provides study materials adapted to the needs of each student, promoting the democratization of teaching (Byju's, 2024).

The examples presented demonstrate that AI has the potential to revolutionize education in different contexts. However, some challenges persist, such as inequality in access to technology, the need for teacher training, and ethical issues related to the collection and use of sensitive data.

In addition, it is observed that the countries with the greatest success in implementing AI invest significantly in technological infrastructure and continuous teacher training, factors that are crucial to ensure that technologies are used effectively and inclusively.

## BENEFITS AND CHALLENGES OF AI IN THE CLASSROOM

Artificial intelligence (AI) has stood out as a transformative tool in the educational environment, presenting benefits ranging from personalizing teaching to supporting teachers and promoting accessibility. However, its adoption also brings challenges that

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must be carefully considered. This chapter initially addresses the positive impacts of AI, detailing how its applications have benefited teaching and learning.

## POSITIVE IMPACTS

The implementation of AI in the classroom has enabled significant advances, promoting pedagogical innovations that benefit students and teachers. Among the main positive impacts are the personalization of teaching, support for teachers and the expansion of educational accessibility.

AI's ability to adapt content and pedagogical strategies to the individual needs of students is one of its most notable contributions. Platforms such as DreamBox Learning and Knewton use algorithms that analyze students' progress, adjusting activities according to their level of knowledge and learning pace. This personalized approach not only improves learning efficiency but also increases student engagement since the content is shaped to meet their preferences and difficulties.

According to Johnson et al. (2016), the personalization provided by AI has the potential to reduce educational inequalities, allowing students with different learning paces to achieve similar results.

In addition to benefiting students, AI has proven to be an ally of teachers, automating administrative tasks and offering tools for data analysis. Software such as Turnitin, for example, assists in detecting plagiarism, while automated assessment platforms help teachers identify performance patterns and adjust their pedagogical practices (Luckin et al., 2016).

In addition, virtual assistants, such as Jill Watson, developed by the Georgia Institute of Technology, provide immediate support for student FAQs, allowing teachers to devote more time to strategic and interactive activities (Goel; Polepeddi, 2016).

AI has played a crucial role in promoting educational inclusion. Tools such as Microsoft Immersive Reader and Google Classroom have accessibility features that serve students with visual, hearing, or cognitive disabilities, promoting more inclusive learning (Holmes *et al.,* 2019). It is worth remembering that inclusion goes beyond simply allowing everyone to participate, it is a commitment to equity, diversity, and respect for human dignity (Costa Júnior *et al.,* 2024).

For example, real-time machine translation and AI-based text readers make it easier for students to learn in multilingual contexts or those with reading difficulties. For students

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with motor disabilities, voice command-based interfaces provide greater independence in the use of digital platforms (Redecker et al., 2011).

These benefits demonstrate that AI, when integrated effectively, can transform the classroom into a more inclusive, efficient, and adaptable environment. However, maximizing these advantages requires investments in technological infrastructure, continuous teacher training, and educational policies that encourage the ethical and responsible use of technology.

## MAIN CHALLENGES: INEQUALITY OF ACCESS, TECHNOLOGICAL DEPENDENCE CA, ETHICAL ISSUES

While artificial intelligence (AI) offers numerous benefits to the educational environment, its adoption also brings challenges that must be tackled carefully. This topic explores three main areas of difficulty: inequality of access, technological dependency, and ethical issues related to the use of AI in education.

As with any other technology, the implementation of artificial intelligence in education also brings challenges and restrictions, including the requirement for teacher training, ethical and legal issues, technological dependence, and other technical and financial elements (Costa Júnior *et al.,* 2023).

One of the most evident challenges in the implementation of AI in education is the inequality of access. The technological infrastructure required for the use of AI tools, such as computers, high-speed internet connection, and mobile devices, is not always available in all regions, especially in developing countries. This reality creates a significant educational disparity, where only students in urban areas or with greater financial support have access to the educational innovations provided by AI.

According to Warschauer and Matuchniak (2010), the digital divide is directly related to socioeconomic, cultural, and geographic factors, hindering educational equity. In addition, the lack of technological infrastructure also affects the continuing education of teachers, who often do not have access to training courses or resources to use AI-based tools.

The over-integration of AI into the educational environment can lead to technological dependency, hindering the development of traditional skills such as critical thinking, problem-solving, and creativity. When AI tools take on tasks such as grading assessments, lesson planning, and even personalized teaching, there is a risk that teachers and students

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will become overly reliant on these technologies (Selwyn, 2016).

In addition, technological dependence can generate institutional vulnerabilities in cases of technical failures, interruptions in energy supply, or cyberattacks. As highlighted by Holmes et al. (2019), the resilience of the education system is reduced when emerging technologies are not complemented by traditional teaching practices.

The use of AI in education also raises important ethical issues, such as data privacy, algorithmic bias, and impact on teacher autonomy. AI systems frequently collect data from students, such as performance history, learning preferences, and online behavior. Without proper regulation, this data can be misused, violating students' privacy rights (Zuboff, 2019).

Another concern is algorithmic bias, which can perpetuate social and cultural inequalities. For example, algorithms trained on limited databases can discriminate against students from minorities or underrepresented regions (Binns, 2018). In addition, teachers' autonomy can be compromised, as some AI-based platforms tend to prioritize standardized approaches, reducing pedagogical flexibility (Luckin et al., 2016).

The challenges presented reinforce the need for a balanced approach to the adoption of AI in education. To mitigate the effects of inequality of access, governments and institutions must invest in technological infrastructure and teacher training. Regarding technological dependence, it is essential to promote a balance between traditional practices and digital innovations. Regarding ethical issues, clear policies and robust regulations must be established to protect students and teachers, promoting a fair and inclusive educational environment.

## SKILLS FOR TEACHERS AND STUDENTS IN THE AGE OF AI

Incorporating artificial intelligence (AI) into the educational environment not only transforms the way teaching is conducted but also redefines the competencies needed for educators and students. Teachers need to acquire specific technological and pedagogical skills to use these tools effectively, while students must develop new ways of learning and interacting with emerging technologies. This chapter examines the essential skills for teachers and how they impact the education landscape in the age of AI.

### SKILLS NEEDED FOR EDUCATORS TO USE AI

The adoption of AI in education requires teachers to become facilitators of learning,

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able to integrate technological tools into the curriculum strategically and ethically. This requires a combination of technical, pedagogical and interpersonal skills.

Digital literacy is critical for teachers to understand the functionalities of AI-based tools. According to Prensky (2010), it is essential for educators to know the operation of intelligent systems, such as adaptive learning platforms, chatbots, and virtual assistants. This competency allows teachers to select the technologies that are best suited to their students' needs.

In addition to knowing the technologies, teachers need to adapt their pedagogical practices. The integration of AI requires a student-centered pedagogical approach, where the teacher acts as a mediator, using data provided by AI to personalize teaching and promote student autonomy.

A practical example is the use of learning dashboards, which provide real-time analysis on students' progress. These tools allow educators to identify learning gaps and implement tailored interventions.

Digital ethics is an indispensable skill in the age of AI. Teachers must be able to assess the social and ethical impacts of using smart technologies. According to Anderson and Rainie (2018), issues such as privacy, data security, and algorithmic biases should be considered when adopting technological solutions in the classroom.

An example is the awareness of the responsible use of student data. Many AI systems collect sensitive information, such as academic performance and behavior, requiring teachers to ensure compliance with data protection regulations, such as the General Data Protection Law (LGPD) in Brazil.

Continuous training is essential for teachers to keep up with technological advances. Training courses, workshops, and specific certifications in educational technologies are recommended strategies to keep educators up to date. Training programs that combine theory and practice significantly increase teachers' confidence in using AI.

The skills required for educators in the age of AI go beyond the technical domain, encompassing pedagogical, ethical, and critical aspects. Continuous training and engagement in reflective practices are essential for teachers to maximize the benefits of AI, promoting a more inclusive, personalized, and effective education.

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COMPETENCIES EXPECTED OF STUDENTS IN A TECHNOLOGICALLY ADVANCED EDUCATIONAL ENVIRONMENT

With the introduction of advanced technologies, including artificial intelligence (AI), into the educational environment, students are called upon to develop new competencies that go beyond traditional skills. Mastering these skills is crucial for the full insertion of students in an increasingly digital and interconnected world. This topic explores the key skills needed for students to enjoy the benefits of educational technologies.

Digital literacy is one of the most fundamental skills for students. According to Buckingham (2007), this ability involves not only the ability to use technological devices, but also to understand, analyze and create digital content. In environments where AI is widely applied, students need to interact with adaptive platforms, data-driven tools, and intelligent systems to personalize their learning experience.

A practical example is e-learning platforms that adapt content to the needs of each student. For this, it is essential that students know how to interpret the reports generated, adjust their goals, and explore additional resources offered by technology.

Artificial intelligence offers a huge amount of information and learning possibilities, but it is essential for students to develop critical thinking to evaluate this information judiciously. According to Facione (2011), the ability to question the validity and relevance of the data presented is essential in an environment where AI can present biases or inaccuracies.

In addition, problem-solving is intensified in a technologically advanced environment. Tools such as simulators and AI applications help students explore creative solutions to complex challenges.

The use of AI in education encourages students to take a more active role in managing their learning. According to Zimmerman (2002), self-regulation involves setting clear goals, monitoring progress, and adjusting study strategies as needed. On platforms that utilize AI, such as intelligent tutoring systems, students have the opportunity to learn at their own pace, requiring greater responsibility and discipline.

This autonomy is crucial for success in hybrid or remote learning environments, where direct supervision by teachers is limited.

Technologically advanced educational environments promote interaction between students from different backgrounds and locations. According to Dillenbourg (1999), collaboration in digital environments requires skills such as clear communication,

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teamwork, and effective use of digital collaboration tools, such as videoconferencing platforms, chats, and collaborative editors.

These competencies are particularly important in projects that use AI to promote group learning, such as platforms that connect students globally to solve real problems.

With the increased use of AI, students must also develop an ethical understanding about the use of these technologies. This includes respecting data privacy, combating false information, and raising awareness about the social and environmental impacts of technology (Anderson & Rainie, 2018).

For example, when using systems that collect personal data to personalize learning, students should be aware of their rights and responsibilities regarding the use of that data.

The advancement of artificial intelligence in education not only alters teaching methods but also requires students to have a new range of skills that are essential to navigate a digitally advanced world. Digital literacy, critical thinking, autonomy, collaboration, and digital ethics are indispensable skills for students to become effective learners and conscious citizens in a technology-driven society.

## DISCUSSION ON CONTINUING EDUCATION AND TEACHER TRAINING

The insertion of artificial intelligence (AI) in the educational context requires a reconfiguration of pedagogical practices, directly implicating teacher training and training. Teachers must not only understand the technical aspects of AI tools, but also incorporate these technologies into didactic approaches that promote more effective and student-centered learning. This topic analyzes the relevance of continuing education as a means of enabling teachers to meet the challenges of contemporary education.

Initial teacher education, in many cases, does not take into account technological advances and their pedagogical implications, especially with regard to AI. In this context, continuing education emerges as an indispensable strategy. According to Tardif (2014), teaching practice is permeated by knowledge that is developed throughout the career, and constant updating is a requirement to keep up with changes in the educational field.

Continuing education programs, such as courses, workshops, and specializations, should prioritize training in technological tools that use AI. These programs offer teachers the opportunity to explore both the potential of these technologies and their limitations.

While continuing education is widely recognized as necessary, there are significant challenges in its implementation. Among them, the inequality of access to quality training

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programs stands out, especially in peripheral regions or in educational systems with few resources. In addition, many teachers are resistant to the incorporation of technologies due to lack of familiarity with them or because they do not clearly perceive their benefits.

Overcoming these challenges requires consistent investments by governments and educational institutions, as well as public policies that encourage teachers to adhere to these initiatives.

Training teachers to use AI tools involves more than teaching technical use. It is necessary for teachers to understand the ethical, pedagogical and social foundations of these technologies. As Anderson and Rainie (2018) point out, artificial intelligence has significant ethical implications, such as the possibility of reinforcing prejudices and inequalities, which should be addressed in training programs.

In addition, it is essential to integrate critical reflection on how AI can influence the role of the teacher. Rather than replacing teachers, these technologies should be seen as complementary tools that allow teachers to focus on more creative and humane aspects of education (Freire, 1996).

Some initiatives around the world already demonstrate the feasibility of training teachers to deal with AI effectively. In Brazil, for example, the National Program for Educational Technology (ProInfo) has promoted the inclusion of digital technologies in basic education, including teacher training (Brasil, 1997).

Continuing education and teacher training are indispensable elements to ensure that technological advances, such as artificial intelligence, are used in an ethical and pedagogical way in schools. Investments in public policies, equitable access to training programs, and a holistic approach that contemplates technical, ethical, and pedagogical aspects are key to preparing teachers for the challenges and opportunities of the twenty-first century.

## FINAL CONSIDERATIONS

Throughout this article, it has been possible to examine the impact of artificial intelligence (AI) on education, highlighting its contributions, challenges, and implications for teachers and students. The analysis began with a contextualization of the rise of AI in society, followed by a historical overview of its insertion in the educational sector. It was highlighted how technological tools have transformed the dynamics of classrooms, providing personalization of teaching, accessibility and pedagogical support.

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Benefits discussed include the ability to personalize learning to each student's needs, broaden the reach of education to historically marginalized populations, and alleviate some administrative tasks for teachers. However, challenges were also explored, such as inequality of access, technological dependence, and the complex ethical issues that emerge with the use of AI in the school environment.

In the field of competencies, the need for robust preparation for teachers to use AI ethically and effectively was highlighted, while students must develop critical, creative, and collaborative skills that allow them to navigate technologically advanced educational environments. Continuing education and teacher training were identified as fundamental pillars to ensure the appropriate use of these technologies.

In addition, practical examples of implementation in Brazil and around the world illustrated how AI is already being applied in education, demonstrating its transformative potential, but also alerting to the importance of public policies and consistent investments that promote equity in access to technologies.

The future of artificial intelligence in education presents a vast horizon of possibilities, but it also requires careful reflection on its development and application. The trend is for AI-based technologies to become increasingly integrated into pedagogical practices, not only as support tools, but as core elements of a more adaptive, personalized, and efficient education system. However, this integration must be accompanied by a critical and ethical view, considering social inequalities and potential impacts on teacher and student autonomy.

It is clear that AI in education has the potential to revolutionize teaching and learning processes, but its effectiveness depends on factors such as adequate infrastructure, public policies that prioritize equity, and the training of trained professionals. In addition, it is essential to address the ethical issues associated with the collection and use of data, ensuring the privacy and security of those involved in the educational environment.

However, for the implementation of artificial intelligence in education to be successful, ethical, and inclusive, it is essential that governments and institutions create public policies that ensure equitable access to educational technologies, especially in disadvantaged regions. Investments in infrastructure and connectivity are key to reducing the digital divide.

Teachers need continuous training that goes beyond the technical use of AI, including ethical, pedagogical and social aspects. This requires the development of training

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programs that prepare teachers to face the challenges and explore the potential of these technologies.

The use of AI in education must be governed by clear ethical principles, with special attention to the privacy and security of student data. It is essential to establish regulations that limit the misuse of information collected by AI platforms.

It is necessary to foster research on the impacts of AI on education, especially in local contexts, to develop solutions that are culturally relevant and socially inclusive. In this sense, the implementation of AI technologies must involve teachers, students, parents, and school administrators, ensuring that all actors understand and participate in the process.

Therefore, AI-based solutions must consider the cultural, economic, and educational specificities of each region, avoiding the uncritical import of global models that may not meet local needs.

By pointing in the direction of such conditions, it is possible to advance the integration of artificial intelligence in education in a responsible and inclusive manner, ensuring that these technologies promote not only efficiency and innovation, but also social justice and equity in access to quality education.

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