

ORIGINAL

## Artificial Intelligence applied to teaching and learning processes

### Inteligencia Artificial aplicada a los procesos de enseñanza-aprendizaje

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#### ABSTRACT

Artificial Intelligence (AI) transforms teaching and learning processes by personalizing educational content according to individual students' needs, thus enhancing their performance and motivation. Tools like SlidesAI and Tome facilitate the creation of efficient educational resources, although the quality and privacy of generated data need to be addressed. AI also enables interactive and immersive learning environments, such as simulations and educational games, that adapt in real-time to students' actions. These environments provide richer and more practical experiences. Additionally, the creation of multilingual videos with avatars enhances accessibility and customization of learning. However, ensuring equitable access to these technologies is crucial to avoid educational inequalities. As demonstrated, AI offers multiple benefits for education but requires careful implementation to maximize its advantages and mitigate potential risks.

**Keywords:** Artificial Intelligence; Personalized Learning; Educational Resources; Interactive Environments; Educational Accessibility.

#### RESUMEN

La Inteligencia Artificial (IA) transforma los procesos de enseñanza-aprendizaje al personalizar el contenido educativo según las necesidades individuales de los estudiantes, de esta forma, mejora su rendimiento y motivación. Herramientas como SlidesAI y Tome facilitan la creación de recursos educativos eficientes, aunque es necesario abordar la calidad y privacidad de los datos generados. La IA también habilita entornos de aprendizaje interactivos y envolventes, como simulaciones y juegos educativos, que se adaptan en tiempo real a las acciones de los estudiantes. Estos entornos proporcionan experiencias más ricas y prácticas. Además, la creación de vídeos multilingües con avatares mejora la accesibilidad y personalización del aprendizaje. No obstante, es crucial asegurar un acceso equitativo a estas tecnologías para evitar desigualdades educativas. Como se ha demostrado, la IA ofrece múltiples beneficios para la educación, pero requiere una implementación cuidadosa para maximizar sus ventajas y mitigar posibles riesgos.

**Palabras clave:** Inteligencia Artificial; Personalización del Aprendizaje; Recursos Educativos; Entornos Interactivos; Accesibilidad Educativa.

#### INTRODUCTION

Artificial Intelligence (AI) is emerging as a crucial tool in the transformation of teaching and learning processes. This technology has progressively become a tangible reality with the potential to revolutionize the way educators teach and students learn. In the last decade, the integration of AI in various sectors has

demonstrated its ability to improve efficiency and personalization, so the educational field is no exception in terms of efforts for its introduction.<sup>(1,2)</sup>

In the educational context, AI has been applied to create systems that can adapt to individual student needs, improve administrative management, and provide new teaching and assessment methods. These systems can analyze large amounts of data to personalize educational content, provide real-time feedback, and help identify areas where students need more support.<sup>(3,4,5)</sup>

One of the biggest benefits of AI is its ability to personalize learning. AI systems can adapt the content and pace of learning to the individual needs of each student, thus providing personalized resources and activities that improve learning effectiveness.<sup>(6,7)</sup> This tool is crucial in contexts of teaching massification while facilitating predictive approaches to phenomena such as underachievement or dropout.

Moreover, AI also transforms administrative management in educational institutions. From scheduling to resource management, AI helps automate routine tasks. This allows educators and administrators to focus on more critical aspects of teaching and management.<sup>(8,9)</sup>

AI-based systems can provide more accurate and detailed assessments of student performance. Through the analysis of patterns in student data, these systems can provide instant and specific feedback to help students continuously improve.<sup>(10,11)</sup> In an era where support and coaching strategies have become established as indicators of quality, these supports streamline and refine the management of the cabinets or centers dedicated to their implementation.

On the other hand, AI allows the emergence of new types of interactive and immersive learning environments. Adaptive educational simulations and games allow students to explore and learn in contexts that replicate real-world situations, making learning more engaging and effective.<sup>(12,13)</sup>

Artificial intelligence as a resource redefines the educational landscape, offering new opportunities and tools to improve teaching-learning processes. This transformation promises not only to make education more accessible and personalized but also to prepare students for an increasingly digital and automated future. Therefore, this article aims to explore the current and future trends of AI in education, its most promising applications, and the challenges that need to be overcome for effective implementation.

## **METHODS**

This article is based on a documentary review to explore the current applications and trends of Artificial Intelligence (AI) in teaching-learning processes.<sup>(14,15)</sup> The stages followed during the development of the review are described below.

Conducting a documentary review is relevant and valid due to the fact that it allows for the systematic collection and analysis of existing information on a specific topic, which contributes to establishing a solid base of prior knowledge and identifying gaps in current research. In addition, this methodology guarantees transparency and objectivity by following source selection and evaluation criteria, which provides confidence in the results obtained and facilitates the replicability of the review in future studies.<sup>(16,17,18,19)</sup>

### **Source Selection**

A strategy that included consultation with academic databases such as Google Scholar, PubMed, and Scopus was used to select relevant sources of information. Inclusion and exclusion criteria were applied to select relevant articles, reports, and papers. In addition, manual searches were performed, and experts in the field were consulted to ensure the selection was complete.

### **Search and data collection process**

The search for information was carried out using specific keywords such as “artificial intelligence in education,” “personalization of learning,” “AI-generated educational resources,” “interactive learning environments,” and “educational accessibility.” Boolean operators were used, and time and language limits were set to refine the results. Additional searches were performed on the references of the selected articles.

### **Criteria for selection and evaluation of source quality**

The criteria used to select and evaluate the quality of the information sources included aspects such as relevance of the content, scientific rigor, methodological soundness of the studies, timeliness of the documents, and reputation of the sources. Priority was given to papers presenting empirical evidence and case studies on the implementation of AI in educational contexts.

### **Data analysis process and ethical considerations**

The data extracted from the selected sources were analyzed using synthesis techniques. Recurrent themes and categories in the contents were identified, relevant data were extracted, and the information collected was organized systematically. The critical analysis allowed me to identify the main trends, benefits, challenges,



As proven, AI's ability to personalize learning transforms education into a more efficient, inclusive, and motivating experience. Not only does this technology address the educational needs of each student in an individualized manner, but it also prepares learners for a future in which personalized and adaptive skills will be increasingly valued.

### Educational Content Creation with Generative AI

Artificial Intelligence significantly facilitates the creation of educational resources while optimizing time and costs for teachers. This technology enables the automatic generation of a wide variety of didactic materials, such as infographics, presentations, and glossaries, providing educators with efficient tools to improve their classes.<sup>(29,30)</sup>

The generation of infographics using AI allows teachers to present complex information in a visual and accessible way, which facilitates students' understanding and retention of concepts. Automated presentations, on the other hand, not only save time in preparation but also ensure that materials are consistent and of high quality. Likewise, the creation of customized glossaries can help students become familiar with subject-specific terminology.<sup>(31,32)</sup>

However, the implementation of AI in the creation of educational resources also presents several challenges. One of the main risks is the inconsistent quality of the generated content. Although AI tools are capable of producing materials efficiently, errors may arise in the accuracy and relevance of the information provided. This aspect requires careful review by teachers to ensure that the resources are adequate and accurate.<sup>(33,34)</sup>

Another major challenge is data privacy. The collection and use of personal student data to personalize and generate educational content raises concerns about data protection. It is essential to implement robust security measures and comply with privacy regulations to protect sensitive data and prevent misuse.<sup>(35,36)</sup>

Therefore, while AI offers numerous advantages for the creation of educational resources, improving efficiency, and reducing costs, it is critical to address the associated risks to ensure ethical and effective implementation. Ongoing human review and the adoption of sound data protection practices are essential to maximize the benefits of AI in the educational setting and ensure that all learners can benefit equitably from these advanced technologies.

### Immersive Learning Environments

Artificial Intelligence is enabling more interactive and immersive learning environments. AI-based educational simulations and games adapt in real time to students' actions and decisions, providing a dynamic and personalized learning experience.<sup>(37, 38)</sup> These environments allow students to explore and learn in simulated contexts that replicate real-world situations. This aspect not only enriches learning but also improves knowledge retention by providing practical and relevant applications.<sup>(39,40)</sup>

The ability of AI to create these interactive environments is based on its ability to analyze data in real time and adjust content based on learners' needs and responses. Similarly, educational games can offer adjustable difficulty levels and immediate feedback, which will keep learners engaged and motivated as they progress.<sup>(41,42)</sup>

In addition to interactive learning environments, AI facilitates the creation of multilingual videos with avatars, an element that significantly improves the accessibility and personalization of learning. These videos can present educational content in multiple languages and enable learners who speak different languages to access the same information effectively. AI-generated avatars can act as virtual tutors by providing explanations and assistance in the learner's preferred language, which is especially beneficial in multicultural and multilingual educational contexts.<sup>(43,44)</sup>

Personalization of learning through AI does not stop at content adaptation but also includes the creation of immersive experiences that can motivate and engage learners. AI can create virtual reality (VR) and augmented reality (AR) environments where learners can interact with three-dimensional elements, explore complex concepts in a visual and hands-on way, and collaborate with other learners in a shared virtual space.<sup>(45,46)</sup>

However, implementing these advanced learning environments also presents challenges. Creating and maintaining AI-based educational simulations and games requires significant investment in technology and development. In addition, it is crucial to ensure the quality and accuracy of the content generated, as well as the protection of learners' data.<sup>(47, 48)</sup> Equity in access to these technologies must also be an important consideration. This is because not all students may have access to the devices and connectivity needed to take full advantage of these tools.<sup>(49,50)</sup>

## CONCLUSIONS

Artificial Intelligence has proven to be an essential tool in the personalization of learning, adapting educational content and methods to the individual needs and rhythms of each student. This personalization capability not only improves academic performance but also increases student engagement and motivation by

providing a more relevant learning experience tailored to their specific needs.

The implementation of AI in the creation of educational resources has significantly optimized the time and costs associated with the development of learning materials. Tools such as SlidesAI and Tome allow teachers to generate infographics, presentations, and glossaries efficiently, freeing them to focus on more critical aspects of teaching. However, addressing challenges related to inconsistent quality of generated content and data privacy is critical to maximizing the benefits of these technologies.

AI enables more interactive and immersive learning environments, such as educational simulations and games that adapt in real-time to learners' actions and decisions. These environments provide richer and more engaging learning experiences, allowing students to explore and learn in simulated contexts that replicate real-world situations. In addition, AI's ability to create multilingual videos with avatars improves the accessibility and personalization of learning. However, it is crucial to ensure equitable access to these technologies to avoid educational gaps.

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