International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 15s,2025
https://theaspd.com/index.php

Impact Of Artificial Intelligence On Personalized Learning: An Analysis In Higher Education

Raúl Marcelo Chávez Benavides[1], Jhosselyn Briggeth García Aldaz[2], Johana Guadalupe García León[3], Jonathan Cárdenas Benavides[4]
[1]Universidad Estatal de Bolivar, Facultad de Ciencias Administrativas, Gestión Empresarial e Informática, carrera de Administración de Empresas. Guaranda- Ecuador. https://orcid.org/0009-0007-5323-2728, raul.chavez@ueb.edu.ec
[2]Universidad Estatal de Bolívar, Facultad de Ciencias Administrativas, Gestión Empresarial e Informática, Carrera de Gestión de Talento Humano. Guaranda- Ecuador. https://orcid.org/0009-0001-2210-376X, jhosselyn.garcia@ueb.edu.ec
[3]Universidad Estatal de Bolívar, Facultad de Ciencias Administrativas, Gestión Empresarial e Informática, Carrera de Turismo y Hotelería https://orcid.org/0000-0002-5084-6149 jggarcia@ueb.edu.ec
[4]Universidad Estatal de Bolívar. Facultad de Ciencias de la Educación, Sociales, Filosóficas y Humanísticas. Carrera de Pedagogía de la informática. Guaranda, Ecuador; https://orcid.org/0000-0002-9760-602X, jcardenas@ueb.edu.ec

Abstract
Artificial intelligence (AI) is revolutionizing the education sector, especially in higher education, by enabling personalized learning experiences. This article analyzed the impact of AI on learning personalization in higher education institutions, assessing its benefits, challenges, and future prospects. Through a literature review and field research, using qualitative and quantitative approaches and hermeneutic, deductive, and descriptive methods, surveys and interviews were conducted at selected higher education institutions to identify usage patterns of AI-based technologies, such as recommender systems, intelligent tutors, and predictive analytics, demonstrating significant improvements in student performance and retention. Across the three universities surveyed, it was determined that there was an average 18% increase in grades for students who used AI-based adaptive systems. It was concluded that artificial intelligence offers great potential for personalizing higher education, with verifiable benefits in performance, motivation, and efficiency. However, its adoption must consider ethical, technical, and cultural aspects; and, if applied properly, AI has the potential to revolutionize higher education toward more inclusive and student-centered models.
Keywords: *artificial intelligence, learning personalization, higher education, intelligent tutor, adaptive learning.*

INTRODUCTION

The accelerated advancement of artificial intelligence (AI) has generated a significant impact on multiple sectors, with education being one of the most influenced. In the context of higher education, AI makes it possible to design personalized learning systems that respond to the individual needs of students. This transformation promises to go beyond the traditional approach of standardized teaching, facilitating more efficient, inclusive, and motivating learning environments.Higher education faces growing challenges in terms of the diversity of student profiles and the need to offer more inclusive and effective learning experiences. Thus, artificial intelligence (AI) is positioned as a key tool for the personalization of learning. Technologies such as machine learning, data mining and natural language processing make it possible to adapt content, rhythms and pedagogical strategies to the individual needs of students. This article aims to analyze the impact of artificial intelligence on the personalization of learning in higher education institutions. It aims to identify both the benefits and challenges associated with the implementation of these technologies. Based on the personalization of learning, it refers to the adaptation of contents, methods and rhythms of teaching to the characteristics, interests and needs of each student. This approach is based on constructivist theories of learning, which emphasize the importance of active and meaningful student participation. Meanwhile, AI in education comprises systems that can interpret data about students and make decisions to optimize learning processes. The most common applications include: Smart tutors**,** Recommendation systems**,** Predictive Analytics**,** among others.

In the article "Artificial Intelligence in the context of educational training", the need to integrate AI in the educational field to improve teaching and learning methods is emphasized. It is argued that AI can offer innovative tools that transform education, especially after the Covid-19 pandemic, which accelerated digitalization in classrooms. The research is descriptive and documentary, exploring how AI can enrich the educational process. In addition, the opportunities presented by AI to personalize learning are discussed. The article argues for a strategic adoption of AI in education.(Carmen Elena Carbonell-García, 2023) In the study on "Assisting generative artificial intelligence as a pedagogical tool in higher education", he explores the potential of artificial intelligence (AI) to improve university learning. It is highlighted that generative AI can personalize education, adapting to the needs and learning styles of students. In addition, practical applications, such as the creation of educational content and virtual tutoring, are analyzed. The article also addresses the challenges and ethical considerations in the implementation of these tools. Generative AI is presented as a valuable resource to enrich the educational experience in higher education.(Janeth Pilar Diaz Vera, 2024) The article "Design of didactic material to raise quality in the management of the teaching-learning process", highlights the importance of creating effective didactic materials that are aligned with educational objectives. It is emphasized that the design must consider the characteristics and needs of the students to foster active and meaningful learning. Strategies to integrate digital technologies that facilitate interaction and access to content are also addressed. In addition, it is suggested that teacher training is crucial to use these materials effectively, thus contributing to improving the quality of education in the classroom. (María Borroto Pérez, 2008)

Regarding artificial intelligence and education, it is mentioned that AI in education (AIEd) encompasses the development of technologies capable of performing cognitive tasks such as data analysis, natural language understanding, behavior prediction, and the generation of educational content (Holmes et al., 2019). These tools allow the creation of intelligent tutoring systems, virtual assistants, chatbots, automated assessment platforms and learning analytics. On the other hand, personalization of learning involves recognizing individual differences in skills, interests, motivations, and learning styles (Pane et al., 2017). AI-based systems make it possible to adapt content, teaching methods, and learning environments in real-time, improving the student experience and increasing the efficiency of the educational process.

In the same case, UNESCO has published the first consensus on artificial intelligence and education that came after the 2015 Qingdao Declaration, through which UNESCO Member States committed to effectively harness emerging technologies towards the achievement of SDG 4. Where it is recommended:

- Plan AI in education policies to capitalize on the possibilities and address the challenges of AI technologies, adopt whole-of-government, cross-sectoral and multi-stakeholder approaches, and also set local strategic priorities to achieve SDG 4 targets.
- Plan AI in education policies to capitalize on the possibilities and challenges of AI technologies, adopt whole-of-government, cross-sectoral and multi-stakeholder approaches, and also set local strategic priorities to achieve SDG 4 targets
- Promote the equitable and inclusive use of AI, regardless of any disability, social or economic status, ethnic or cultural origin, or geographical location, with an emphasis on gender equality and ensuring the ethical, transparent, and verifiable use of educational data
- Other. (UNESCO, 2023)

However, AI raises significant concerns about the use of personal data, the transparency of algorithms, and the risk of reproduction of bias (Williamson & Eynon, 2020). Higher education must meet these challenges with clear data governance policies, ethical training, and rigorous technology evaluation criteria. Finally, artificial intelligence is a powerful tool that can improve education in many ways, from the personalization of learning to the automation of tasks, consequently the impact of artificial intelligence on education and how it is transforming the educational landscape at all levels, from the personalization of learning to the improvement of feedback and the development of resources to educational inclusion.(Gómez & Arroyo, 2024)

METHODOLOGY

The study combines qualitative and quantitative analysis. A literature review on AI and the personalization of learning was carried out through surveys and interviews in higher education institutions in Ecuador that have implemented tools based on Artificial Intelligence in the teaching-learning process. For the research development, field research was used with a mixed approach, that is, for a better understanding of the problem, the characteristics of AI and the personalization of learning in higher education institutions in Ecuador were qualitatively addressed; and, quantitatively, the numerical representation of the data obtained through the survey, this approach allowed the collection of data that facilitates statistical analysis and thus achieve satisfactory results, these data are analyzed using statistical tools to identify correlations and trends. The research methods applied were hermeneutical, deductive and descriptive.(Chávez, Zula , Bósquez, & Pacheco, 2024) According to hermeneutics, it offers an alternative for research focused on the interpretation of texts. Whereas, the deductive method is a process for obtaining knowledge that consists of developing specific applications or consequences based on general principles; It is sometimes called top-down thinking or going from the general to the specific, because it starts from a general idea and arrives at a specific conclusion according to . And, for the descriptive method, it is usually the best method of collecting information that demonstrates relationships and describes the world as it is.(Quintana & Hermida, 2-19)(Question.pro, n.d.)(ORI, n.d.) By decision of the researchers, a non-probabilistic convenience sampling was carried out, in which members of the university community of a higher education institution in the central highlands of Ecuador and professors in charge of monitoring other professors and students were surveyed, so that, for this type of sampling, it consists of(NETQUEST, 2015)select a sample of the population because it is accessible. That is, the individuals used in the research are selected because they are readily available, not because they have been selected using statistical criteria. Finally, for the processing of results, Microsoft Excel was used for tabulation and graphic visualization and the Word word processor to perform the respective analysis and interpretation of the discourse.

RESULTS

For the present research, two types of samples were defined, of which a survey was applied to the members of the university community of Higher Education Institutions -object of study- and the other sample applied to the professors who are assigned the monitoring of the academic process of students and the academic performance of professors. The survey questions were designed in 4 categories to explore the following aspects: 1. Knowledge and use of AI; 2. Perceptions of personalization of learning; 3. Opinions, challenges and ethical aspects; 4. Final open question. In this sense, the following results are exposed:

Table 1. Role in the institution

Category	Percentage
Student	65.10%
Teacher	29.90%
Other	5,00%

Note: Data collection members of the academic community

Most of the respondents are students (64.3%) and a smaller percentage (29.90%) are professors and few respondents (5%) fulfill another role in Higher Education Institutions. This suggests that any intervention strategy should focus on such populations.

Table 2. Academic Area

Category	Percentage
Administrative Sciences	31.70%
Education Sciences	25.10%
Health Sciences	29.20%
Jurisprudence	12,00%
Other	2,00%

Note: Data collection members of the academic community

It is evident that some areas (such as Administrative and Health) could have greater exposure to AI than others.

Table 3. Modality of studies

Category	Percentage
Face	11.70%
Virtual	35.10%
Hybrid	53.20%

Note: Data collection members of the academic community

The modality of studies made it possible to identify whether the use of AI is more common in virtual or hybrid environments than in face-to-face environments, since AI technologies tend to be more easily integrated into digital platforms.

Question 1: Do you know of AI-based tools applied to education?

Table 4. AI Knowledge

Category	Frequency	Percentage
Yes	351	96,43%
No	13	3,57%

Note: Data collection members of the academic community

With the data collected, it is evident that 96.43% know the tools based on artificial intelligence applied to education and 3.57% do not, so there is high knowledge, which suggests familiarity with the subject.

Question 2: Have you used any of the following AI tools in your learning or teaching process? (multiple choice)

Table 5. Use of AI

Category	Frequency
Adaptive platforms (e.g. Smart Sparrow, Knewton)	123
Virtual assistants or chatbots	204
Content recommendation systems	56
Learning analytics (custom dashboards)	27
Content generators (e.g. ChatGPT, Copilot)	301
Other	20

Note: Data collection members of the academic community

The technological tools are more accessible, used or valued are the content generators followed by virtual assistants or chatbots, which warns that it is necessary to socialize about the use and benefit of other tools to personalize education.

Question 3: How often do you use AI tools in your academic practice?

Table 6. Frequency of AI use

Category	Frequency	Percentage
Never	2	0,55%
Rarely	6	1,65%
Sometimes	68	18,68%
Often	134	36,81%
Always	154	42,31%

Note: Data collection members of the academic community

In academic practice, AI tools are always and frequently used, which determines that the academic community has a direct relationship for the process of generating educational content. High usage may be related to better personalized experience or more prior training.

Question 4: Do you think AI tools have helped personalize your learning/teaching experience?

Table 6. AI's contribution

Category	Frequency	Percentage
Yes, to a large extent	298	81,87%
Yes, to some extent	42	11,54%
No, just	24	6,59%
Not at all	0	0%

Note: Data collection members of the academic community

The data can be directly related to the quality of the platforms used or their pedagogical integration at the time they have mentioned that to a large extent (81.87) and to some extent (11.54%) AI tools have contributed to personalizing the learning/teaching experience.

Question 5: What aspects have been personalized thanks to AI? (multiple choice)

Table 7. Personalization with AI

Category	Frequency
Learning Pace	20
Suggested content	160
Adaptive assessments	39
Interaction and feedback	18
None	1
Other	1

Note: Data collection members of the academic community

Based on the data in Table 7, it is known that personalization focuses on suggested content and adaptive assessments.

Question 6: Has AI personalization improved your academic performance or teaching performance?

Table 8. Academic performance

Category	Frequency	Percentage
A lot	276	75,82%
Something	74	20,33%
Little	14	3,85%
Nothing		0%
None		0%
Other		

Note: Data collection members of the academic community

Personalization through AI has improved academic performance or teaching performance to 75.82% to a large extent and to 20.33% to some extent. This can reveal perceived improvements in motivation, autonomy, efficiency, etc.

Question 7: What concerns do you have about the use of AI in higher education? (multiple choice)

Table 9. Concerns about the use of AI

Category	Frequency
Data Privacy	293
Lack of transparency in algorithms	43
Over-reliance on technology	342
Inequality in access	36
No	30
Other	75

Note: Data collection members of the academic community

It is noted that the greatest concern regarding the use of AI in higher education is the excessive dependence on technology, followed by data privacy and other causes that respondents have.

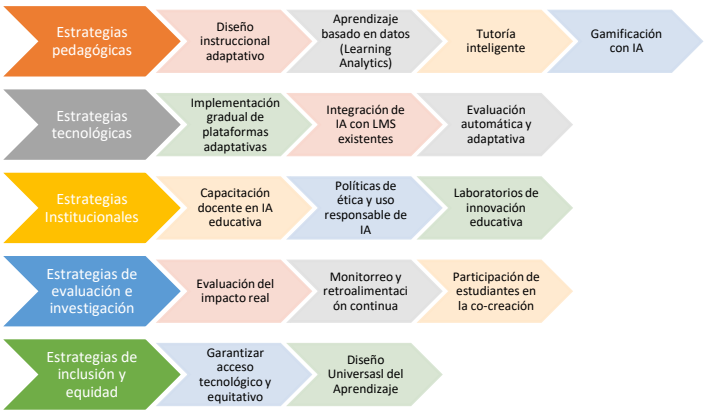
Question 8 Do you consider it necessary to receive training on the ethical and pedagogical use of AI tools?
Table 10. Training on the use of AI

Category	Frequency	Percentage
Yes	354	97,25%
No		0%
I'm not sure	10	2,75%

Note: Data collection members of the academic community
In this case, 97.25% responded that it is necessary to receive training on the ethical and pedagogical use of AI tools, which supports the proposal of teacher training programs.
At the same time, interviews were conducted with the professors who are assigned to monitor the academic process of students and the academic performance of professors, from whom it was obtained that: an average increase of 18% was recorded in the grades of students who used adaptive systems based on AI. Students reported feeling more motivated when interacting with platforms that adapt content to their pace and learning style. Dropout rates decreased by 10% to 15% after the implementation of smart tutoring tools. They noted an improvement in identifying individual needs, allowing for more effective interventions.However, concerns related to the use of personal data, algorithmic biases and transparency in AI decision-making are latent. Lack of interoperability between platforms, errors in learning style recognition and scalability problems. And, that some teachers and students have shown distrust of the partial replacement of pedagogical functions by automatic systems.

DISCUSSION

The results show that AI has a positive impact on the personalization of learning in higher education. However, its successful implementation requires careful integration with pedagogical objectives, as well as clear governance in the use of data. In addition, the need to train both teachers and students in the critical and ethical use of these tools is highlighted. Despite the challenges, the personalization of learning through AI is projected as a key strategy to improve the equity, efficiency, and effectiveness of the education system in the twenty-first century. The results suggest that AI has a positive impact on the personalization of learning in higher education. However, its implementation entails challenges, such as: the need for technological infrastructure; teacher training in digital skills, and ethical considerations on the use of student data. In addition, the importance of maintaining the active role of the teacher as a pedagogical mediator is highlighted, avoiding excessive dependence on algorithms.
(Ayuso & Gutiérrez, 2022)As supported by saying that Artificial Intelligence (AI) is presented as an emerging technology that facilitates the personalization of learning and prepares young people for a changing labor market marked by new social requirements, some strategies for the integration of AI in the personalization of learning in higher education are presented below.
Figure 1.Strategies for integrating AI into the personalization of learning in higher education



Note: proposal based on the data collected. in original Spanish language

CONCLUSIONS

Artificial intelligence represents an opportunity to transform higher education towards more personalized and student-centered models. Although the benefits are remarkable, it is critical to address the technical, pedagogical and ethical challenges for responsible and sustainable implementation; considering that students and teachers positively value the impact of AI, pointing to improvements in learning autonomy, motivation and efficiency. Artificial intelligence offers great potential to personalize higher education, with verifiable benefits in performance, motivation and efficiency, by allowing the adaptation of content, rhythms and assessments to the individual needs of students. For this reason, universities must lead this transition with a critical, collaborative approach and oriented to the well-being of the student.

AI has the potential to revolutionize higher education through the personalization of learning, with positive impacts on the quality and equity of the system. Its implementation requires: Institutional policies that guarantee transparency, privacy and equity, Continuous teacher training in digital and ethical skills, Continuous evaluations of the real impact of educational technologies. Hybrid designs that balance the use of AI with meaningful human mediation, among others.

BIBLIOGRAPHY

1. Carmen Elena Carbonell-García, S. B.-G.-d.-l.-R.-F. (August 18, 2023). SCIELO. Retrieved from https://ve.scielo.org/scielo.php?script=sci_arttext&pid=S2665-02822023000200152
2. Janeth Pilar Díaz Vera, R. M. (2024, 10, 16). Retrieved from https://riti.es/index.php/riti/article/view/294
3. María Borroto Pérez, A. B. (September 2008). Retrieved from https://go.gale.com/ps/i.do?id=GALE%7CA466940901&sid=googleScholar&v=2.1&it=r&linkaccess=abs&issn=16094808&p=IFME&sw=w&userGroupName=anon%7Ecf648b6a&aty=open-web-entry
4. UNESCO. (2023, 04, 20). consensus on artificial intelligence and education. Retrieved from https://www.unesco.org/es/articles/la-unesco-ha-publicado-el-primer-consenso-sobre-la-inteligencia-artificial-y-la-educacion
5. Gómez, M., & Arroyo, A. (2024). The Impact of Artificial Intelligence on Ecuadorian Education. Findings21.
6. Chávez, E., Zula , J., Bósquez, A., & Pacheco, S. (2024). Universal design approach to learning: a theoretical-practical model for quality inclusive education, seen from the Postgraduate and Continuing Education Directorate of the State. Salud, Ciencia y Tecnología - serie de conferencias.
7. Quintana, L., & Hermida, J. (27 of 06 of 2-19). Hermeneutics as a method of interpreting texts in psychoanalytic research. Retrieved from https://www.redalyc.org/journal/4835/483568603007/html/
8. Question.pro. (n.d.). Retrieved from https://www.questionpro.com/blog/es/metodo-deductivo/
9. ORI. (n.d.). Descriptive studies. Retrieved from https://ori.hhs.gov/education/products/sdsu/espanol/res_des1.htm#:~:text=Un%20estudio%20descriptivo%20es%20normalmente,e%20incluir%20en%20el%20experimento.
10. NETQUEST. (2015, 05, 29). Retrieved from https://www.netquest.com/blog/es/blog/es/muestreo-por-conveniencia
11. Ayuso, D., & Gutiérrez, P. (2022). Artificial Intelligence as an educational resource during initial teacher training. Ibero-American Journal of Distance Education, vol. 25, no. 2, 347-362.
12. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence in Education: Promises and Implications for Teaching and Learning. Center for Curriculum Redesign.
13. Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). Intelligence Unleashed: An Argument for AI in Education. Pearson.
14. Pane, J. F., Steiner, E. D., Baird, M. D., & Hamilton, L. S. (2017). Informing Progress: Insights on Personalized Learning Implementation and Effects. RAND Corporation.
15. Selwyn, N. (2019). Should Robots Replace Teachers? AI and the Future of Education. Polity Press.
16. Williamson, B., & Eynon, R. (2020). Historical threads, missing links, and future directions in AI in education. Learning, Media and Technology, 45(3), 223–235. https://doi.org/10.1080/17439884.2020.1798995