













ORIGINAL

The Role of Artificial Intelligence in the Adaptation of Students to Virtual Educational Environments

Rol de la Inteligencia Artificial en la Adaptación de Estudiantes a Entornos Educativos Virtuales

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ABSTRACT

Introduction: in recent decades, the accelerated advance of digital technologies has profoundly transformed educational processes, promoting the expansion of virtual learning environments that transcend physical and temporal barriers.

Objective: to determine the relationship between the role of artificial intelligence in the adaptation of students to virtual educational environments.

Method: quantitative and correlational, non-experimental design. Simple random sampling, with a sample of 376 university students who had studied at least one semester in virtual mode. Data collection was done through structured surveys with Likert-type scales, designed to evaluate the use of AI tools and the level of adaptation of the students.

Results: ai in virtual educational environments showed a significant relationship with student adaptation, facilitating access to information and offering personalized learning experiences.

Conclusions: ai enabled personalization of educational experiences, improving accessibility and making them more interactive. AI-powered learning assistants fostered active participation and greater understanding of content. The importance of avoiding over-reliance on AI tools and promoting interdisciplinary collaboration and real-time feedback to continuously improve educational environments was highlighted.

Keywords: Artificial Intelligence; Educational Adaptation; Virtual Educational Environments.

RESUMEN

Instrucción: en las últimas décadas, el avance acelerado de las tecnologías digitales ha transformado profundamente los procesos educativos, promoviendo la expansión de entornos virtuales de aprendizaje que trascienden las barreras físicas y temporales.

Objetivo: determinar la relación del rol de la inteligencia artificial en la adaptación de estudiantes a entornos educativos virtuales.

Método: cuantitativa y correlacional, de diseño no experimental. De muestreo aleatorio simple, con una muestra de 376 estudiantes universitarios que habían cursado al menos un semestre en modalidad virtual.

La recolección de datos se realizó mediante encuestas estructuradas con escalas tipo Likert, diseñadas para evaluar el uso de herramientas de IA y el nivel de adaptación de los estudiantes.

Resultados: la IA en entornos educativos virtuales mostró una relación significativa con la adaptación de los estudiantes, facilitando el acceso a información y ofreciendo experiencias de aprendizaje personalizadas.

Conclusiones: la IA permitió personalizar las experiencias educativas, mejorando la accesibilidad y haciéndolas más interactivas. Los asistentes de aprendizaje impulsados por IA fomentaron la participación activa y una mayor comprensión del contenido. Se destacó la importancia de evitar la sobre dependencia de las herramientas de IA y promover la colaboración interdisciplinaria y retroalimentación en tiempo real para mejorar continuamente los entornos educativos.

Palabras clave: Inteligencia Artificial; Adaptación Educativa, Entornos Educativos Virtuales.

INTRODUCTION

In recent decades, the rapid advancement of digital technologies has profoundly transformed educational processes, promoting the expansion of virtual learning environments that transcend physical and temporal barriers.⁽¹⁾ In this context, Artificial Intelligence (AI) is a disruptive tool capable of personalizing the educational experience and facilitating students' adaptation to virtual platforms through intelligent systems that detect learning styles, progress levels, and specific needs.⁽²⁾ Understanding AI's role in this adaptation is crucial, especially in an era where distance, blended, and/or virtual education is becoming a viable and, in many cases, necessary alternative. Artificial intelligence and its adaptation by students are particularly relevant, as they link technological innovation with inclusion and educational retention processes in virtual contexts, which are increasingly common in global and local education systems.⁽³⁾

Under this premise,⁽⁴⁾ analyzed the role of AI in adapting students to virtual educational environments, highlighting that AI could personalize the learning experience and facilitate the inclusion of students with different needs. The study was conducted in the context of higher education, where the COVID-19 pandemic had accelerated the adoption of educational technologies. The methodology used included a systematic review of the literature on comparative studies of traditional and VR-based teaching methods, examining various dimensions such as study design, participant characteristics, and educational methodologies employed. The main findings indicated that, although VR-based solutions positively affected student performance and satisfaction, AI could further enhance these benefits by adapting educational content to the individual characteristics of each student, suggesting a complementary rather than a substitute approach to traditional teaching.

A study⁽⁵⁾ analyzes the role of AI, specifically ChatGPT, in helping students adapt to virtual educational environments. The study was conducted in the context of public universities in Indonesia, where the influence of AI on education was an emerging but under-researched topic. The methodology used was a sequential explanatory design that included in-depth interviews with students, teachers, and academic staff, allowing for various insights. The study's main findings indicated that, although ChatGPT offered valuable tools for research and academic preparation, many users considered its use ethically questionable due to concerns about plagiarism. However, its potential to personalize the learning experience and improve teaching was recognized. The authors recommended that the Indonesian Higher Education Commission establish principles and regulations for using AI in higher education.

A study⁽⁶⁾ addressed the critical role of AI in adapting students, especially those with Autism Spectrum Disorder (ASD), to virtual educational environments. The study was conducted in the context of the growing need for inclusive approaches in education and focused on the development of adapted STEM content. A methodology combining Design Science Research and the Delphi method was used to ensure the inclusion of diverse perspectives from experts in special education and educational technology. The main conclusions indicated that AI could enrich the personalization of the learning experience by offering dynamic adjustments based on students' progress and individual responses. In addition, the need to implement real-time feedback mechanisms and the relevance of interdisciplinary collaboration to improve virtual learning environments continuously were highlighted.

A study⁽⁷⁾ examined the role of AI in helping students adapt to virtual educational environments, arguing that AI can facilitate this process by personalizing learning and improving interaction. The study was conducted in Greece in 2022, focusing on how social perceptions of AI influenced its integration into the educational field. The methodology included data collection through surveys and interviews, using a Least Absolute Shrinkage and Selection Operator (LASSO) model to identify significant variables related to the social identity of the participants. The main findings indicated that factors such as social values, religion, and educational level directly impacted students' perceptions of AI, highlighting the need for policies that promote informed and positive acceptance of AI in education, ensuring its contribution to young people's social and academic well-

being.

A study⁽⁸⁾ to analyze the role of AI in students' adaptation to virtual educational environments, pointing out that this technology could offer personalized strategies to meet diverse learning needs, especially for those with disabilities. The study was conducted in a context where traditional educational methods failed to adequately incorporate all students, creating a need to explore innovative approaches through AI. The methodology used artificial neural networks (ANN) to identify patterns between study strategies, learning disabilities, and academic performance, developing an AI-based decision support system that offered recommendations to improve educational approaches. The main conclusions highlighted that integrating AI-mediated study strategies could mitigate the negative impact of learning disabilities, thus promoting a more inclusive and effective academic environment.

A study⁽⁹⁾ whose objective was to understand the role of AI in helping students adapt to virtual educational environments, arguing that AI could facilitate this transition by personalizing learning experiences and optimizing content creation. The study was conducted in the context of a Virtual and Augmented Reality course, where students explored the use of immersive technologies. The methodology included implementing practical projects where students integrated AI tools to improve their creations. The main findings highlighted that by leveraging AI, students could not only enhance the accessibility of educational applications but also make them more interactive and engaging. In addition, the flexibility provided by AI allowed students to experiment and explore their interests, resulting in deeper and more meaningful learning within a virtual environment.

A study⁽¹⁰⁾ analyzed the role of AI in helping students adapt to virtual educational environments, highlighting its potential to personalize the learning experience. The study was conducted in science education, where using Multimodal Language Models (MLLMs) such as GPT-4 enriched student interaction and engagement with the content. The methodology consisted of developing a theoretical framework that promoted the integration of MLLMs in multimodal learning, and various exemplary scenarios were presented to illustrate its application. The conclusions pointed out that, despite the opportunities offered by AI to improve the accessibility and effectiveness of learning, ethical and data protection challenges arose. The importance of a balanced implementation where technology complements the work of educators was emphasized, ensuring the moral and practical use of AI in education.

A research⁽¹¹⁾ determine the role of AI in helping students adapt to virtual educational environments, highlighting its ability to facilitate cultural and linguistic integration, especially among international students. The study was conducted in an undergraduate nursing program at an Australian university, where students' experiences with AI tools were explored. A qualitative methodology was used, incorporating exploratory and descriptive designs, collecting data through interviews, and using thematic analysis. Among the main findings, it was found that AI provided crucial support for personalized learning, helping students overcome specific challenges related to cultural adaptation and language. In addition, a disconnect between student needs and institutional policies was evident, highlighting the importance of a more proactive response from educational institutions in integrating AI.

A study⁽¹²⁾ whose objective was to determine the role of AI in adapting students to virtual educational environments, highlighting its potential to facilitate personalized learning and improve the academic experience. The study was conducted at the University of Cape Coast, Ghana, involving 783 preservice teachers through a descriptive survey design and a convenience sampling technique. An innovative methodological approach was used, combining the structural equation model (PLS-SEM) with artificial neural networks (ANN) to explore the intentions to use AI tools in lesson planning. The main findings revealed that social influence and habits were the most significant factors in future teachers' intention to use AI in their educational practices. In addition, it was highlighted that the perceived usefulness and ease of use of these technologies also positively impacted their adoption.

A study⁽¹³⁾ analyzed the role of AI in students' adaptation to virtual educational environments, emphasizing that this technology played a crucial role in personalizing learning and improving interaction between students and content. The study was conducted in an academic context characterized by a rapid transition to online platforms driven by the pandemic. The methodology consisted of a mixed approach, combining student surveys and interviews with educators to collect data on the learning experience and the use of AI tools. The main findings indicated that virtual assistants and recommendation systems increased motivation and facilitated more adaptive learning, allowing students to navigate available resources effectively. In addition, the importance of ethical implementation that is sensitive to students' individual needs was highlighted to maximize the benefits of AI in virtual education.

A study⁽¹⁴⁾ to determine the role of AI in helping students adapt to virtual educational environments, noting that this technology could transform learning by offering personalized and practical experiences. The study was conducted in an academic context, specifically within institutions implementing learning management systems (LMS), where the LAMB framework was used to develop AI-powered learning assistants. The methodology included the creation of an assistant, "Macroeconomics Study Coach," which integrated course materials and

lecture transcripts, followed by qualitative evaluation of reports and student perceptions of its usefulness. The main findings indicated that learning assistants improved student engagement and understanding and facilitated deeper and more detailed learning, even though concerns were raised about potential dependencies and the need for responsible use of AI.

⁽¹⁵⁾ whose objective was to understand the relationship between the role of AI in students' adaptation to virtual educational environments, concluding that AI can improve learning efficiency by facilitating access to information and offering diverse perspectives. However, concerns were also raised about students' over-reliance on AI, which could diminish their learning experience. The study was conducted in the context of accounting education in Indonesia when online education had become commonplace due to the COVID-19 pandemic. The methodology used was a cross-sectional study that surveyed 218 accounting students using a structured questionnaire, followed by statistical analyses such as the Partial Least Squares Structural Equation Model. The main findings suggested that self-efficacy and digital literacy significantly influenced students' acceptance of AI.

⁽¹⁶⁾ determined a positive stance regarding the role of AI in students' adaptation to virtual educational environments, highlighting how tools such as ChatGPT contributed to improving academic performance and student satisfaction. The study was conducted in the Bachelor of Nursing program at the University of León, Spain, with ninety-eight students enrolled in a Care and Services Management course. The methodology used was a quantitative cross-sectional design, in which data were collected through three validated questionnaires that assessed sociodemographic characteristics, knowledge about AI, and perceptions of ChatGPT as an educational tool. Among the main conclusions, it was found that the use of ChatGPT led to a significant improvement in students' academic grades. Most of them perceived benefits in their academic performance, demonstrating the importance of integrating AI into education.

⁽¹⁷⁾ to understand the role of AI in helping students adapt to virtual educational environments, highlighting its ability to personalize and improve the learning experience. The study was conducted in the context of distance and open education, reviewing 64 studies published between 2017 and 2023. A systematic review methodology was used, including the selection and analysis of relevant studies on adopting AI and its impact on academic performance. The study's main conclusions indicated that, although AI had the potential to enrich educational processes, there was a notable lack of a unified framework to predict its impact. In addition, gender and geographical differences in AI adoption were highlighted, suggesting that, to reap its benefits fully, a better understanding of these contextual factors in distance learning environments was necessary.

⁽¹⁸⁾ highlighted that AI, particularly ChatGPT, played a crucial role in helping students adapt to virtual educational environments. The study was conducted in the context of universities in northern Peru, where the interaction of 595 students with this emerging technology was analyzed. The methodology consisted of an online survey containing sections on informed consent, sociodemographic data, and a questionnaire that measured students' attitudes through cognitive, affective, and behavioral components. The results showed that the affective and cognitive components positively influenced students' behavior toward ChatGPT. However, the study found no significant moderating effects of age or gender on these relationships. Understanding these attitudes could guide the effective implementation of artificial intelligence in education, improving the learning experience.

⁽¹⁹⁾ analyzed the role of AI in students' adaptation to virtual educational environments, concluding that this technology could personalize the academic experience by adjusting to individual learning needs and rhythms. The study was conducted at a public university in Mexico, in a context where online education had become an essential complement to face-to-face teaching. The methodology used was descriptive and quantitative, involving 252 students and using validated tools to assess cross-cutting skills, socio-educational practices, and the relevance of online activities. The main conclusions revealed that, although students developed skills such as critical and creative thinking, significant areas required attention, such as research, entrepreneurship, and English proficiency. Integrating AI into educational platforms was suggested to address these shortcomings.

⁽²⁰⁾ studied the role of AI in helping students adapt to virtual educational environments, highlighting that AI could facilitate this process by providing personalized and adaptive experiences. The study was conducted in a context where the proliferation of AI-based tools coincided with the rise of online education, driven by the COVID-19 pandemic. A literature review methodology covered publications from the last ten years and focused on activities that fostered a critical understanding of AI among young people aged 5 to 18. The main findings indicated that, while there were significant opportunities to integrate AI into education, it was crucial to implement a critical approach that allowed students to question and reflect on these emerging technologies' social, political, and ethical implications.

⁽²¹⁾ concluded that AI is crucial in helping students adapt to virtual educational environments, especially in assessing engagement and emotion when nonverbal cues are limited. The study was conducted in virtual reality (VR) learning contexts, where the objectives were to overcome difficulties related to the direct observation of facial expressions among students. Using Convolutional Neural Network (CNN) methodologies, the team

adapted a ResNet50-based model to recognize subtle expressions in real-time, focusing primarily on the lower part of the face, given that VR hides the rest. The findings highlighted that the customized model improved emotion recognition accuracy and provided educators with practical tools to adjust their approaches and enhance the educational experience by addressing students' emotional needs.

⁽²²⁾ analyzed the role of AI in helping students adapt to virtual educational environments, highlighting that this technology provided new opportunities to improve learning personalization and facilitate collaborative interaction. The study was conducted in the context of increasing integration of emerging technologies in education, especially between 1990 and 2022, when research in Computer-Supported Collaborative Learning (CSCCL) was revitalized. The methodology used included a bibliometric analysis, which involved reviewing 6388 academic documents and combining topic modeling and network analysis techniques to identify trends, influential authors, and emerging topics. The findings indicated that, although AI offers innovative tools for collaborative learning, it also poses challenges regarding theoretical coherence and global representation in CSCCL research, highlighting the need to adapt to future educational demands.

⁽²³⁾ examined the role of artificial intelligence (AI) in helping students adapt to virtual educational environments, highlighting its potential to personalize the learning experience and improve self-directed learning skills. The study was conducted in the context of nursing education during the COVID-19 pandemic, when virtual technologies became increasingly relevant. The methodology employed was analytical and descriptive, using surveys and a machine learning model that combined traditional statistical approaches to assess students' perspectives on virtual reality technologies and their level of self-directed learning. The main findings indicated that students had a positive attitude toward virtual reality and that, despite specific gender differences in self-directed learning skills, the results were encouraging, suggesting that AI and virtual reality could enrich nursing education and improve learning effectiveness.

As can be seen from the state of the art, the accelerated incorporation of digital technologies in the educational field has led to a profound reconfiguration of how teaching-learning processes are conceived, designed, and implemented. In particular, virtual educational environments have become a key alternative for ensuring educational continuity in emergencies, such as the pandemic, and in scenarios with difficult geographical access. However, in the Peruvian context, this transition has revealed structural and pedagogical limitations that affect students' ability to adapt to these environments. Difficulties include low familiarity with digital platforms, limited personalized feedback, and a lack of online tools that promote student autonomy and motivation.

In this context, AI emerges as a technological solution with high potential to address these challenges by developing adaptive systems capable of personalizing learning, detecting behavior patterns, and offering automated and contextualized support. However, the effective implementation of these technologies in the Peruvian education system is still in its infancy, and there is limited empirical evidence of their real impact on student adaptation. This situation raises a central question: What role does Artificial Intelligence play in adapting students to virtual educational environments in the Peruvian context?

This research is relevant and necessary due to the rise of virtual learning environments and the growing incorporation of intelligent technologies in education. In Peru, in particular, emergency situations accelerated the migration to distance learning models but also highlighted multiple shortcomings in terms of technological infrastructure, teacher training, and student-centered pedagogical strategies. In this context, AI is emerging as a strategic tool that can significantly contribute to personalizing the learning experience, facilitating student adaptation, and reducing dropout rates and academic underperformance in virtual environments.

The research also has scientific and practical value. From an academic standpoint, it seeks to provide evidence of the relationship between AI and adaptation processes in online learning, a field still emerging in the country. From an applied perspective, the findings could guide more effective and inclusive educational policies, institutional decisions, and pedagogical designs. The primary beneficiaries will be students at basic and higher levels, innovative teachers, educational platform developers, training institutions, and decision-makers in the education sector. In addition, this study contributes to achieving the Sustainable Development Goals (SDGs), particularly SDG 4: Quality Education, by proposing technology-based solutions to reduce learning gaps.

As a result, this study aims to explore how AI-based tools can positively impact Peruvian students' adaptation to virtual environments, thereby strengthening a more equitable, efficient, and inclusive education. The direct beneficiaries of this study include primary and secondary school students, teachers seeking to innovate their methodologies, designers of digital educational platforms, and educational policymakers seeking to improve the quality of education in the country by harnessing the potential of technology in the service of learning.

METHOD

This research took a quantitative approach, seeking to determine, through data collection and statistical analysis, the relationship between artificial intelligence and students' adaptation to virtual educational

environments. This approach made it possible to identify patterns, relationships, and levels of association between the variables considered.

This type of research was applied because its purpose is to provide practical solutions to a current educational problem through the integration of emerging technologies.

The level was correlational, as the aim was to determine the degree of relationship between the use of Artificial Intelligence-based tools and the level of students' adaptation to virtual learning environments.

A non-experimental, cross-sectional, and correlational design was used. The variables will not be deliberately manipulated but observed as they occur in their natural context. The study will be conducted simultaneously, analyzing the relationship between the variables in a specific situation.

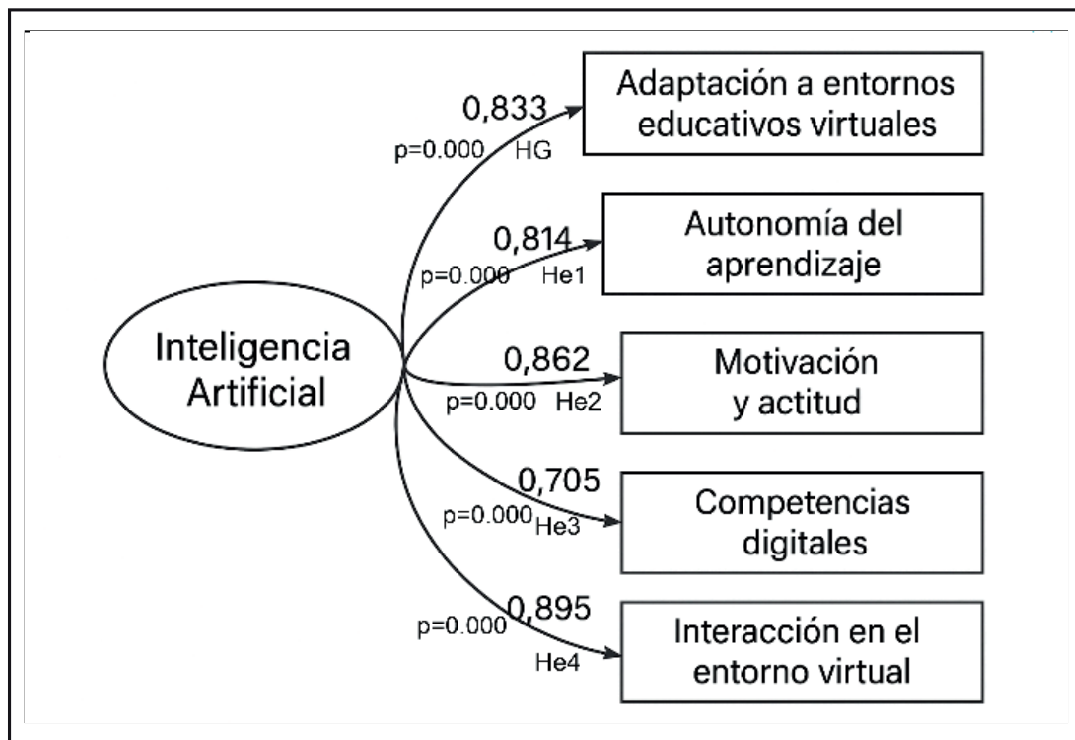
The population consisted of 17358 university students who, according to the National Superintendency of Higher University Education (SUNEDU) platform, had completed at least one semester in a virtual modality. The sample consisted of 376 students and was selected through simple, probabilistic, random sampling.

The technique used was a survey, and the instrument was a structured questionnaire designed according to the dimensions of the variables. For the variable "use of artificial intelligence tools," there were 12 items. For the variable "level of adaptation to the virtual environment," there were 12 items, all with a Likert scale from 1 to 5, which were validated by expert judgment and a pilot test to ensure their reliability and validity.

The data collected were processed using SPSS v.26 statistical software, through which normality and inferential statistical tests were applied.

RESULTS

Figure 1 shows a structural equation model that analyzes the relationships between AI and the dimensions of student adaptation to virtual educational environments. The results show that AI has a positive relationship with the dimensions studied. The highest correlation coefficient is observed between AI and interaction in the virtual environment (0,895), indicating that AI significantly improves student participation in activities within the virtual classroom. This strong relationship suggests that AI facilitates interaction between students and the platform and between students and teachers, promoting greater collaboration and communication.



Note: HG: There is a relationship between the role of artificial intelligence in students' adaptation to virtual educational environments. He1: There is a relationship between the role of artificial intelligence in students' learning autonomy in virtual educational environments. He2: There is a relationship between the role of artificial intelligence in students' motivation and attitude toward virtual educational environments. He3: There is a relationship between the role of artificial intelligence and students' digital skills in virtual educational environments. He4: There is a relationship between the role of artificial intelligence and students' interaction in virtual educational environments.

Figure 1. Relationship between study variables

AI also strongly correlates positively with student motivation and attitude (0,862). This means that AI increases students' willingness to actively participate in virtual learning, which is crucial for academic success in distance learning environments.

The model also reveals that AI strongly correlates with learning autonomy (0,814). This finding suggests that integrating AI in virtual educational environments encourages self-regulation and students' ability to manage their learning, essential in environments where direct teacher supervision is limited.

Although the relationship between AI and students' digital skills shows a moderate correlation (0,705), this value is still significant. It suggests that AI positively impacts the development of students' technological skills, which is essential for online learning.

Finally, adaptation to virtual educational environments also strongly correlates with AI (0,833), implying that students who interact with AI-based systems tend to adapt more quickly and successfully to virtual learning environments.

The p-values associated with these correlations are extremely low (below 0,05), indicating that all observed relationships are statistically significant. This reinforces that AI significantly correlates with student adaptation and performance in virtual educational environments.

As a result, it is confirmed that there is a relationship between the role of Artificial Intelligence and student adaptation to virtual educational environments. The specific hypotheses are also validated, showing that AI positively correlates with learning autonomy, motivation and attitude, digital skills, and interaction in the virtual environment.

These results indicate that Artificial Intelligence is crucial in improving various aspects of virtual learning, favoring student adaptation, fostering motivation, autonomy, and participation, and contributing to the development of digital skills. These findings underscore the importance of incorporating AI-based technologies into virtual educational environments to optimize the learning experience and improve academic outcomes in the current context of distance education.

DISCUSSION

The results of this study are consistent with:⁽⁴⁾ This study analyzes how AI can personalize the learning experience and facilitate the inclusion of students with different needs, especially in higher education. Our research also found that AI positively impacts students' adaptation to virtual educational environments, which aligns with the idea that personalizing learning can improve student engagement and performance. This approach does not replace traditional teaching but complements it, enhancing the educational experience through technologies such as virtual reality (VR), which AI can enhance.

They are similar to:⁽⁵⁾ In this case, the impact of ChatGPT on higher education in Indonesia was analyzed, where students considered the tool valuable for research and academic preparation. Although ethical concerns were raised, such as plagiarism, the potential of AI to personalize the learning experience was recognized. Similarly, our study showed that AI can improve student motivation and attitude, making it easier for them to adapt to online learning. This connection suggests that, although ethical challenges are essential, AI can be highly beneficial when integrated responsibly.

Consistent with:⁽⁶⁾ This study highlights the potential of AI to help students with Autism Spectrum Disorder (ASD) better adapt to virtual educational environments through dynamic personalization of instruction. AI can adjust content based on individual progress and responses, improving learning autonomy. This finding aligns with our results, which show that AI fosters self-regulation and students' ability to manage their learning, especially in an environment with limited direct supervision.

Aligned with:⁽⁷⁾ In Greece, research investigated how social perceptions influenced the integration of AI in education. The study concluded that factors such as social values and education impact the acceptance of AI. Our results coincide with this idea, as students' motivation and attitude toward AI are crucial for its successful adoption. Thus, educational policies must promote informed acceptance of AI to maximize its academic benefits.

They align with:⁽⁸⁾ The study on using AI in inclusive education demonstrates how AI can offer personalized strategies that address diverse learning needs, especially for those with disabilities. In our case, we found that AI positively impacts the development of digital skills, improving the academic performance of students, even those with learning difficulties. These types of technologies offer a more inclusive education tailored to the individual needs of each student.

They agree with:⁽⁹⁾ This study highlights how AI improves the accessibility of educational applications and makes them more interactive. The findings of this study coincide with our results, which show that virtual interaction and active participation are enhanced by the personalization of content through AI. AI's ability to tailor educational applications to the needs of each student contributes to a more accessible and engaging learning experience.

Similar to,⁽¹⁰⁾ this study shows how integrating multimodal language models such as GPT-4 can enrich students' interaction with educational content. Similar to our results, which indicate a positive relationship between AI and motivation, this study suggests that AI can improve student interaction and engagement, creating a more

immersive and practical educational experience.

Similar to,⁽¹¹⁾ in an undergraduate nursing program in Australia, AI was shown to help international students overcome cultural and linguistic barriers, facilitating their adaptation to the virtual educational environment. This study reflects our findings on how AI can personalize learning to overcome specific student challenges, such as language and culture, enabling a more inclusive educational experience.

They are comparable to:⁽¹⁶⁾ In this study, the use of ChatGPT contributed to improving the academic performance of nursing students. Similar to our results, which highlight that AI improves motivation and academic performance, this study shows how AI can optimize the educational experience, especially in distance learning contexts, such as the one we are experiencing during the pandemic.

Consequently, the reviewed studies corroborate the results of the present study by highlighting how AI improves various aspects of students' adaptation to virtual educational environments. Personalization of learning, fostering motivation and learning autonomy, and improving digital skills and virtual interaction are key factors that AI enhances. These findings underscore the importance of integrating AI-based technologies to optimize the educational experience, especially in virtual environments, where personalization and accessibility are essential for student success.

CONCLUSIONS

The results obtained in this study corroborate the idea that Artificial Intelligence plays a crucial role in helping students adapt to virtual educational environments. AI improves students' learning autonomy, motivation, and digital skills and optimizes interaction in the virtual environment, creating a richer and more personalized learning experience. The findings underscore the importance of integrating AI-based technologies into virtual education to improve academic outcomes and promote more inclusive, accessible, and effective learning.

The study has shown that artificial intelligence (AI) has a strong positive relationship with students' adaptation to virtual educational environments. The results indicate that students who interact with AI-based systems are more likely to adapt quickly to virtual environments, as AI facilitates the personalization of learning and optimizes the educational experience, improving accessibility and participation. This confirms that AI contributes significantly to students' successful transition to virtual educational environments.

The findings suggest that AI positively influences students' learning autonomy by promoting self-regulation and control over their educational process. The correlation between AI and learning autonomy was strong, implying that AI-based systems enable students to manage their time, set personal goals, and make informed decisions about their learning. This study highlights the importance of AI in strengthening student independence, especially in distance learning contexts.

The research shows that AI significantly impacts student motivation and attitude. Using AI-based technologies, such as recommendation systems, instant feedback, and content adaptations, improves students' interest and willingness to participate actively in virtual learning. With a strong correlation between AI and motivation, this study highlights how AI can increase students' desire to engage in virtual environments, contributing to academic success on distance learning platforms.

Although the relationship between AI and digital skills was moderate, the results still demonstrate that AI has a positive impact on the development of students' technological skills. AI-based systems facilitate the learning of digital tools and encourage improving the skills needed to navigate virtual platforms effectively. This indicates that AI can play a key role in strengthening digital skills, a crucial aspect of distance education.

The study concludes that using AI significantly improves interaction in the virtual environment. AI facilitates communication between students, teachers, and the learning platform, which promotes greater collaboration and participation. The highest correlation observed in this study between AI and interaction in the virtual environment (0,895) indicates that students who use AI-based tools interact more actively and effectively, resulting in more dynamic and collaborative learning.

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