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Technological strategies, motivation and academic performance in higher education: a systematic review

Estrategias tecnológicas, motivación y rendimiento académico en educación superior: una revisión sistemática

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Abstract

This systematic review analyzes the relationship between technological strategies, motivation, and academic performance in higher education, based on scientific research indexed in Scopus. The study was conducted using a qualitative-documentary approach, following the PRISMA 2020 guidelines. The literature search was performed using advanced Boolean operators and eligibility criteria related to academic motivation, academic performance, higher education, and educational technologies. Initially, 109 studies were identified, which underwent temporal, thematic, and methodological filtering processes, ultimately selecting 24 scientific articles published between 2024 and 2025. The results show that gamification, artificial intelligence, virtual platforms, blended learning, and technology-mediated active methodologies contribute significantly to strengthening motivation, engagement, and academic performance at the university level. Furthermore, the studies highlight that variables such as self-efficacy, self-regulation, and teacher-student interaction play a fundamental role within digital learning environments. It is concluded that technological strategies are relevant tools for optimizing university educational processes; however, their effectiveness depends on proper pedagogical integration, methodological planning, and faculty support within contemporary virtual environments.

Keywords: technological strategies, academic motivation, academic performance, higher education, digital learning.

Resumen

La presente revisión sistemática analiza la relación entre las estrategias tecnológicas, la motivación y el rendimiento académico en la educación superior a partir de investigaciones científicas indexadas en Scopus. El estudio se desarrolló bajo un enfoque cualitativo-documental siguiendo los lineamientos PRISMA 2020. La búsqueda bibliográfica se realizó mediante operadores booleanos avanzados y criterios de elegibilidad relacionados con motivación académica, rendimiento académico, educación superior y tecnologías educativas. Inicialmente se identificaron 109 estudios, los cuales fueron sometidos a procesos de filtrado temporal, temático y metodológico, seleccionándose finalmente 24 artículos científicos publicados entre 2024 y 2025. Los resultados evidencian que la gamificación, la inteligencia artificial, las plataformas virtuales, el aprendizaje híbrido y las metodologías activas mediadas por tecnología contribuyen significativamente al fortalecimiento de la motivación, el *engagement* y el desempeño académico universitario. Asimismo, los estudios destacan que variables como la autoeficacia, la autorregulación y la interacción docente-estudiante desempeñan un papel fundamental dentro de los entornos digitales de aprendizaje. Se concluye que las estrategias tecnológicas constituyen herramientas relevantes para optimizar los procesos educativos universitarios; sin embargo, su efectividad depende de la adecuada integración pedagógica, la planificación metodológica y el acompañamiento docente dentro de los entornos virtuales contemporáneos.

Palabras clave: estrategias tecnológicas, motivación académica, rendimiento académico, educación superior, aprendizaje digital.

Introduction

Higher education is currently undergoing a rapid transformation driven by the development of digital technologies that have reshaped traditional teaching and learning dynamics. The integration of virtual platforms, hybrid environments, artificial intelligence, gamification, and interactive resources, for example, has given rise to new forms of academic interaction and to various mechanisms for strengthening student participation in university settings. In this context, recent research has shown that educational technologies not only facilitate access to information but also directly influence student motivation, academic engagement, and performance at the university level (García-López et al., 2023; Chambi et al., 2023; Cabrera-Solano, 2020).

Consequently, scientific interest in understanding the relationship between academic motivation and university performance has grown considerably in recent years, largely due to the changes brought about by digital education and virtual learning environments. González-Benito et al. (2021) contend that academic motivation and perceived self-efficacy bear a significant relationship with academic performance among distance education university students. Similarly, Gutiérrez and Tomás (2019) found that autonomy support and academic engagement foster university success through student self-efficacy. Likewise, Yarin et al. (2022) documented a positive relationship between motivation and academic performance among Peruvian university students, while Acosta-Gonzaga (2023) highlighted self-esteem and academic commitment as relevant factors in university performance.

Within contemporary educational settings, academic motivation has become an essential component for sustaining learning in digital and hybrid modalities. Various studies indicate that active participation, self-regulation, and sustained interaction with technological tools promote student retention and performance. Abello et al. (2022) argued that motivational climate and teaching style significantly influence self-regulation and academic achievement at the university level. In a similar vein, Siqueira et al. (2020) identified a direct relationship between metacognitive awareness and motivation to learn among university students, underscoring the importance of emotional regulation in higher education learning processes.

Within this scenario, gamification has emerged as one of the most extensively studied technological strategies in higher education, owing to its effects on motivation and academic engagement. García-López et al. (2023) provided evidence that gamified dynamics strengthen student participation and academic performance, while Lluch Molins et al. (2022) noted that gamification strategies simultaneously enhance cooperative learning and university motivation. Along similar lines, Cano and Rojas (2022) identified significant improvements in academic performance through collaborative strategies supported by technological resources. Furthermore, Chambi et al. (2023) maintained that mobile learning techniques generate positive motivational effects among higher education students.

Research related to virtual platforms and digital learning, for its part, shows that technological environments have redefined university educational experiences. Cabrera-Solano (2020) demonstrated that digital portfolios strengthen communication skills and learning in higher education. Likewise, Vianchá and Parra (2023) analyzed predictors of academic achievement in distance education, highlighting the importance of autonomy and technological adaptation within virtual learning environments.

Despite the growing body of research on educational technologies in higher education, theoretical and methodological dispersion persists regarding how these strategies simultaneously influence motivation and academic performance. Many studies examine specific digital tools in isolation, while others focus exclusively on motivational variables or performance indicators. This situation underscores the need for recent systematic reviews that synthesize the main scientific findings and provide a broader understanding of current trends concerning technological strategies applied to university learning.

Consequently, the present study is relevant in that it analyzes recent research indexed in Scopus over the 2024–2025 period, a phase marked by a significant expansion of studies related to educational artificial intelligence, gamification, virtual platforms, and digital learning. The review aims to offer an updated perspective on the impact of technological strategies on motivation and academic performance in higher education, allowing for the identification of predominant approaches, methodological trends, and relevant contributions for future research and pedagogical practice.

Accordingly, the objective of this systematic review is to analyze the scientific evidence concerning technological strategies, motivation, and academic performance in higher education, drawing on studies indexed in Scopus during the 2024–2025 period.

Methodology

This study was developed as a systematic review of the scientific literature, oriented toward analyzing the relationship between technological strategies, motivation, and academic performance in higher education.

To ensure methodological transparency and rigor throughout the selection and analysis of evidence, the procedures outlined in the PRISMA 2020 statement, widely employed in systematic reviews within academic and scientific contexts, were followed.

The literature search was conducted exclusively in the Scopus database, given its extensive international coverage, high indexing standards, and recognition within high-impact scientific production.

The search process took place during 2026 and considered scientific publications from the 2024–2025 period, motivated by the notable increase in research on educational artificial intelligence, gamification, digital learning, virtual platforms, and hybrid teaching models in higher education. The search strategy was structured using Boolean operators and advanced *TITLE-ABS-KEY* retrieval fields, employing the following equation:

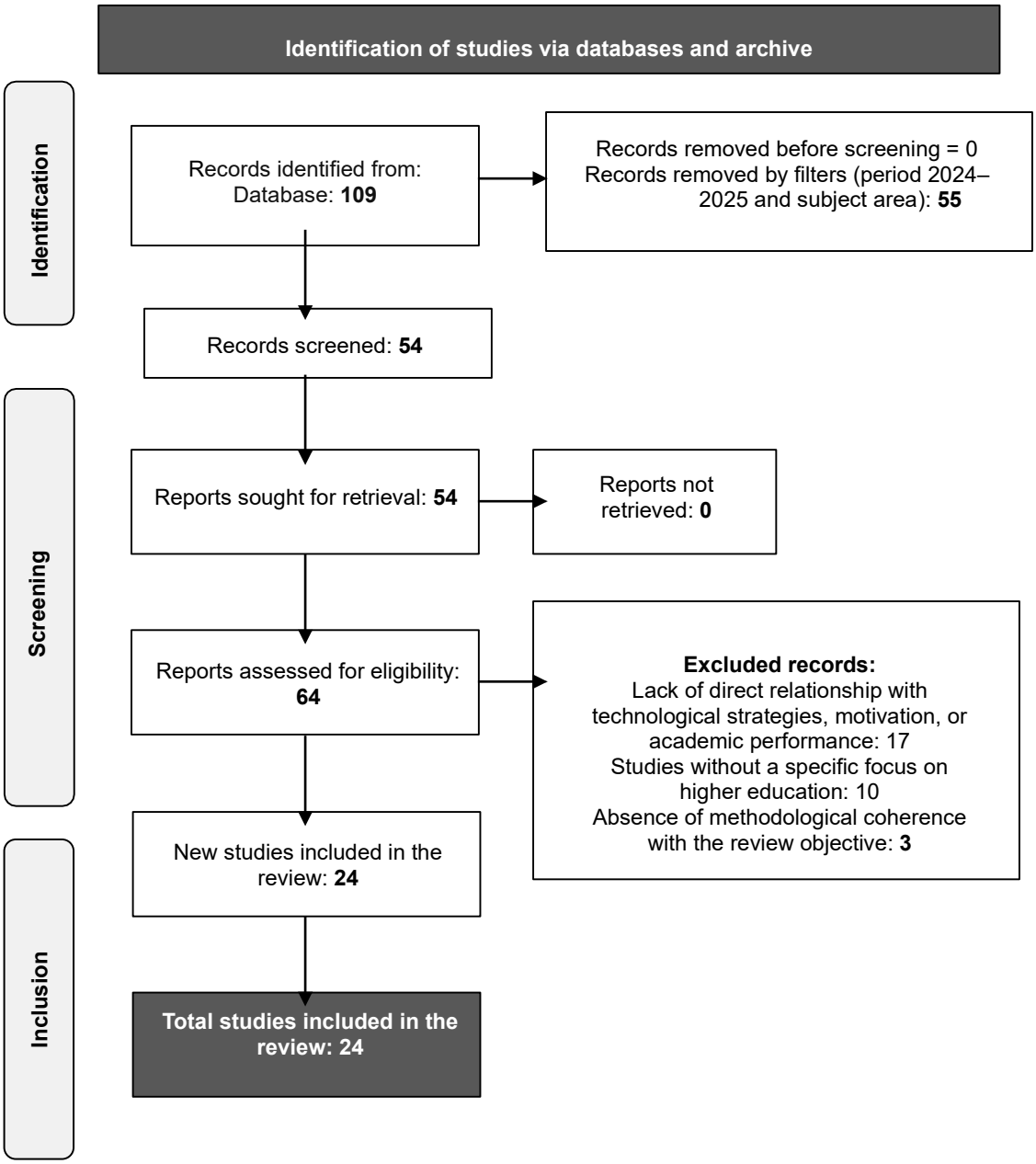
TITLE-ABS-KEY (("academic motivation" OR "student motivation" OR "intrinsic motivation" OR "extrinsic motivation") AND ("academic performance" OR "academic achievement" OR "learning outcomes") AND ("university students" OR "higher education" OR undergraduates) AND (gamification OR "educational technology" OR e-learning OR "virtual learning" OR "digital learning" OR "online learning" OR ICT OR "virtual platforms")) AND PUBYEAR > 2020 AND PUBYEAR < 2026 AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Spanish")) AND LIMIT-TO (DOCTYPE , "ar") AND (LIMIT-TO (SUBJAREA , "SOCI") OR LIMIT-TO (SUBJAREA , "PSYC") OR LIMIT-TO (SUBJAREA , "COMP")) AND (LIMIT-TO (SUBJAREA , "SOCI")) AND (LIMIT-TO (EXACTKEYWORD , "Higher Education") OR LIMIT-TO (EXACTKEYWORD , "Motivation") OR LIMIT-TO (EXACTKEYWORD , "Academic Performance") OR LIMIT-TO (EXACTKEYWORD , "E-learning") OR LIMIT-TO (EXACTKEYWORD , "Educational Technology") OR LIMIT-TO (EXACTKEYWORD , "Student Engagement") OR LIMIT-TO (EXACTKEYWORD , "Active Learning") OR LIMIT-TO (EXACTKEYWORD , "Learning Performance") OR LIMIT-TO (EXACTKEYWORD , "Learning Outcomes") OR LIMIT-TO (EXACTKEYWORD , "Student Motivation") OR LIMIT-TO (EXACTKEYWORD , "Self-regulated Learning")) AND PUBYEAR > 2024 AND PUBYEAR < 2025

It should be noted that this search strategy initially identified 109 documents in the Scopus database.

A first temporal filter was subsequently applied, considering only studies published between 2024 and 2025, which resulted in the exclusion of 50 publications that did not fall within the established period. In a second phase, the search was restricted to the Social Sciences subject area due to its disciplinary relevance to the variables under analysis, leading to the exclusion of five additional studies from other knowledge fields.

Thereafter, a refinement process was carried out using keywords directly linked to the study variables, such as academic motivation, academic performance, higher education, gamification, e-learning, digital learning, and educational technologies. As a result of this procedure, 17 articles that did not present sufficient thematic relevance to the research purpose were removed. A preliminary review of titles and abstracts followed, during which ten additional studies were excluded owing to thematic duplication, insufficient connection to the variables analyzed, or lack of a specific university focus. Finally, a comprehensive review of titles, abstracts, and full-text content of the remaining studies was conducted, applying eligibility criteria related to methodological coherence and the central focus of the investigations. In this final stage, three further studies were excluded because they did not directly address the interplay between technological strategies, motivation, and academic performance in university contexts. Following the selection and screening process, the final corpus consisted of 24 scientific articles included for systematic analysis.

Figure 1
PRISMA flow diagram



To organize and synthesize the main findings identified in the selected studies, various thematic axes related to technological strategies, motivation, and academic performance in higher education were established.

Table 1
Thematic axes identified in the studies

Thematic axis	Axis description	Principal approaches identified in the studies

Gamification and Academic Engagement in Higher Education	Analyzes the impact of gamified dynamics and interactive resources on student motivation and participation.	Gamification, digital badges, game-based learning, Kahoot!, academic engagement, interactive learning.
Artificial Intelligence and Emerging Technologies Applied to University Learning	Examines the use of artificial intelligence and emerging digital technologies within university educational processes.	ChatGPT, educational artificial intelligence, AI-generated content, adaptive systems, augmented reality, emerging technologies.
Virtual Platforms and Digital Learning Environments	Studies the use of digital platforms and virtual modalities in academic performance and motivation.	e-learning, LMS, virtual platforms, online learning, hybrid environments, digital education, HyFlex courses.
Self-Regulated Learning, Motivation, and Academic Performance	Explores how motivation and self-regulation influence university academic achievement.	Intrinsic motivation, extrinsic motivation, self-efficacy, autonomous learning, engagement, academic performance.
Pedagogical Innovation and Technological Methodologies in Higher Education	Addresses technology-mediated active methodologies aimed at improving the university learning experience.	Flipped classroom, digital feedback, active methodologies, collaborative learning, pedagogical innovation, teacher-student interaction.

Note. The thematic axes were developed from the comparative analysis of the 24 scientific studies selected in the systematic review indexed in Scopus for the 2024–2025 period

The categorization presented in Table 1 allowed the studies to be grouped according to their predominant approaches, facilitating the comparative analysis of current trends in the recent scientific literature.

Results and discussion

Analysis of the 24 selected scientific studies revealed a growing trend toward incorporating technological strategies as tools for strengthening motivation and academic performance in higher education. The research retrieved from Scopus during the 2024–2025 period shows that digital technologies have moved beyond being supplementary resources to becoming structural components of university educational processes. From the comparative analysis of the included articles, five predominant thematic axes emerged: gamification and academic engagement, artificial intelligence and emerging technologies, virtual platforms and digital learning, self-regulated learning and academic performance, and technology-mediated pedagogical innovation.

Gamification and academic engagement in higher education

Research on gamification shows that interactive dynamics implemented in higher education contribute meaningfully to strengthening student motivation and commitment. Maimaiti and Hew (2025) found that gamified strategies applied in flipped classrooms foster self-regulated learning and reduce the progressive decline of academic strategies, while Lampropoulos and Sidiropoulos (2024) contended that gamified environments yield better learning outcomes compared to traditional methodologies. Similarly, Luo (2024) demonstrated that digital badge systems increase student participation and academic engagement within virtual environments. Likewise, Camacho-Sanchez et al. (2024) concluded that the application of gamified methodologies based on the ARCS model (Attention, Relevance, Confidence, Satisfaction) simultaneously strengthens university motivation and academic performance.

Along these same lines, Borras-Gene and Diez (2025) highlighted that incorporating digital badges and flipped classroom approaches generates more active participation among university students, while Gaggioli et al. (2025) noted that gamification promotes academic engagement and improves interaction within the learning process. Singh et al. (2024) also identified positive outcomes through the use of Kahoot! as a tool for monitoring academic performance in higher education. Taken together, these studies indicate that gamification has become an effective technological strategy for increasing student motivation, although its effectiveness depends on the appropriate pedagogical integration of digital resources and the methodological planning undertaken by the instructor.

Artificial intelligence and emerging technologies applied to university learning

Recent studies show significant growth in the use of artificial intelligence and emerging technologies in higher education. In this vein, Nguyen-Viet and Doan (2025) argued that integrating artificial intelligence and gamification favors motivation and learning effectiveness from the perspective of self-determination theory. Similarly, Mwilongo and Mwita (2025) identified intrinsic motivation as a mediating variable between artificial intelligence use and university academic performance. Likewise, Elhag et al. (2025) analyzed generative tools such as ChatGPT and Gemini, concluding that these technologies increase motivation and improve academic performance when used as pedagogical support within university learning.

Elsewhere, Aydemir and Kir (2025) compared AI-generated content with human-created materials, revealing relevant differences in student interaction and participation. Soriano-Sanchez and Jimenez-Vazquez (2025), for their part, highlighted that augmented reality fosters learning motivation in higher education, while Amanova et al. (2025) found that technological tools can influence both learning outcomes and student anxiety levels. Consequently, the studies reviewed show that emerging technologies are redefining university educational dynamics, though they also pose challenges related to academic ethics, digital literacy, and technological dependence.

Virtual platforms and digital learning environments

Research linked to virtual platforms and digital learning shows that technological environments continue to play a central role in contemporary higher education. Lin et al. (2025) argued that e-learning maintains a positive relationship with university academic performance, particularly when factors such as academic motivation and self-efficacy intervene. In the same direction, Yang (2024) found that virtual platforms favor academic performance when they promote accessibility, interaction, and sustained student participation. Similarly, Chetioui et al. (2024) analyzed online learning in university contexts and concluded that satisfaction and positive attitudes toward virtual environments directly influence academic performance.

In a similar vein, Mamani-Flores et al. (2025) examined the use of virtual learning environments among Peruvian university students, providing evidence that adequate integration of digital platforms strengthens academic commitment and improves student participation. Yang et al. (2025) also highlighted that HyFlex models favor university adaptation through flexible hybrid learning schemes. Barbashova et al. (2025), for their part, maintained that virtual education requires psychological and pedagogical support to ensure satisfactory educational experiences. Collectively, the studies reviewed show that digital learning depends not only on technological access but also on the quality of interactions and the pedagogical design implemented within virtual environments.

Self-regulated learning, motivation, and academic performance

Self-regulated learning emerged as another predominant axis within the studies analyzed. Chan et al. (2025) contended that online courses based on adaptive learning strengthen autonomy and significantly favor university academic performance. Likewise, Rimasiute-Knabikiene and Dirzyte (2025) identified different motivational profiles among e-learning students, finding important variations in academic engagement and emotional well-being. Doan et al. (2025), meanwhile, highlighted that student-instructor interaction directly influences learning outcomes in higher education.

Ferriz-Valero et al. (2025), for their part, concluded that digital feedback applied in flipped classrooms simultaneously strengthens motivation and university academic performance. The findings further showed that self-efficacy, intrinsic motivation, and self-regulation capacity represent essential factors within contemporary technological environments. Consequently, the studies reviewed converge in their finding that technology produces better results when students develop autonomy, persistence, and active participation in their own learning process.

Pedagogical innovation and technological methodologies in higher education

Research related to pedagogical innovation shows that technology-mediated active methodologies are progressively transforming university teaching processes. Ferriz-Valero et al. (2025) noted that the flipped classroom and digital feedback strengthen learning and improve academic performance. Similarly, Singh et al. (2024) provided evidence that interactive tools such as Kahoot! allow for monitoring academic performance and increasing student participation. Gaggioli et al. (2025), likewise, argued that gamified methodologies increase university engagement and foster more dynamic learning environments.

Along these lines, Vélez Loor et al. (2025) developed instruments for evaluating gamified strategies in e-learning environments, demonstrating the importance of measuring the pedagogical impact of educational

technologies. Similarly, Lin et al. (2025) and Yang et al. (2025) concurred that virtual and hybrid environments require innovative methodologies centered on flexibility, interaction, and autonomous learning. Consequently, the studies analyzed show that contemporary pedagogical innovation consists not merely of incorporating technology into the classroom, but rather of transforming educational dynamics toward more interactive, participatory, and student-centered models.

In sum, the 24 scientific studies analyzed indicate that technological strategies play a relevant role in strengthening motivation and academic performance in higher education. Gamification, artificial intelligence, e-learning, blended learning, and active methodologies emerge as predominant trends within recent research. Nevertheless, the findings also show that technology alone does not guarantee educational improvements, since its impact depends on pedagogical design, teacher-student interaction, student self-regulation, and the appropriate integration of digital resources within university educational processes.

Conclusion

The scientific studies analyzed show that technological strategies play a relevant role in strengthening motivation and academic performance in higher education. For instance, gamification, artificial intelligence, virtual platforms, blended learning, and active methodologies demonstrate positive effects on engagement, self-efficacy, participation, and university learning outcomes.

Moreover, the research reviewed consistently indicates that teacher-student interaction, digital feedback, and self-regulated learning constitute essential factors for optimizing the impact of educational technologies on contemporary educational processes.

Similarly, the systematic review made it possible to identify that emerging technologies do not guarantee academic improvements by themselves, as their effectiveness depends on sound pedagogical integration and the methodological planning developed within university settings. Consequently, higher education institutions need to strengthen educational models centered on digital innovation, technological competencies, and motivational strategies that foster more dynamic, flexible, and participatory learning experiences.

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