Virtual learning environments and their effectiveness in the academic and emotional success of university students: A systematic review

Entornos virtuales de aprendizaje y su eficacia en el éxito académico y emocional de los universitarios: una revisión sistemática

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REVISTA INVECOM ISSN: 2739-0063
Received: 15-02-2025 Accepted: 26-04-2025
2026. V6. N1.

Abstract
In recent years, the use of virtual learning environments (VLE) in university education has experienced a notable increase, a phenomenon that intensified as a result of the pandemic and has been further driven by the emergence of artificial intelligence. Given this scenario, there was a need to answer questions related to the effectiveness of these environments on academic performance and their impact on students' emotional development, two fundamental factors for both learning achievement and retention in the educational system. In this context, this systematic review analyzed selected articles under the inclusion criteria established by the PRISMA methodology. To this end, the available evidence was considered in 37 documents, extracted from a total of 140 identified in databases such as Scopus and Scielo, corresponding to the period between 2014 and 2024. The results reveal that 67% of the research consulted supports the effectiveness of active participation in VLEs as a significant predictor of university students' academic performance and emotional development. This is because these environments foster autonomy, self-efficacy, and motivation. However, 33% of the studies reviewed disagree with these findings, pointing to negative emotional effects. In these cases, situations of stress and anxiety associated

with the use of VLEs were identified, mainly attributable to connectivity issues, lack of technological resources, and limited interaction with the teacher. It is worth noting that Moodle was the most studied VLE platform, which opens the door to future research on other alternatives, such as gamification platforms and social media-mediated learning.

Keywords: well-being, virtual learning environment, academic performance, university students.

Resumen

En los últimos años, el uso de entornos virtuales de aprendizaje (EVA) ha experimentado un notable incremento en la educación universitaria, fenómeno que se intensificó a raíz de la pandemia y se ha visto aún más impulsado por la irrupción de la inteligencia artificial. Ante este escenario, surgió la necesidad de responder a interrogantes relacionados con la eficacia de estos entornos en el rendimiento académico y su impacto en el desarrollo emocional de los estudiantes, dos factores fundamentales tanto para el logro de los aprendizajes como para la permanencia en el sistema educativo. En este contexto, la presente revisión sistemática analizó artículos seleccionados bajo los criterios de inclusión establecidos por la metodología PRISMA. Para ello, se consideró la evidencia disponible en 37 documentos, extraídos de un total de 140 identificados en bases de datos como Scopus y Scielo, correspondientes al periodo comprendido entre 2014 y 2024. Los resultados revelan que el 67% de las investigaciones consultadas respaldan la eficacia de la participación activa en los EVA como un predictor significativo del rendimiento académico y del desarrollo emocional de los estudiantes universitarios. Esto se debe a que dichos entornos favorecen la autonomía, la autoeficacia y la motivación. Sin embargo, el 33% de los estudios revisados discrepan de estos hallazgos, señalando efectos negativos en el ámbito emocional. En estos casos, se identificaron situaciones de estrés y ansiedad asociadas al uso de los EVA, atribuibles principalmente a problemas de conectividad, carencia de recursos tecnológicos y escasa interacción con el docente. Cabe destacar que Moodle fue la plataforma de EVA más estudiada, lo que abre la puerta a futuras investigaciones sobre otras alternativas, como las plataformas de gamificación y el aprendizaje mediado por redes sociales.

Palabras clave: bienestar, entorno virtual de aprendizaje, rendimiento académico, universitarios.

Introduction

Currently, virtual learning environments (VLE) have taken on a prominent role in the educational field. This advancement has been facilitated by the rapid development of Information and Communication Technologies (ICT), as well as the need to address challenges arising from exceptional situations, such as social isolation. VLE represent an educational modality characterized by flexibility, accessibility, and the extensive availability of digital resources—qualities that have piqued the interest of educators, families, and policymakers.

However, the true impact of these environments on students, particularly among adolescents, remains a subject of debate. Given that adolescence is a crucial stage for academic and emotional development, it is essential to analyze how VLE influence these dimensions. On one hand, research suggests that VLE can enhance academic performance by offering personalized and accessible learning experiences (García et al., 2024). On the other hand, concerns have been raised regarding their influence on psychological well-being, social skills, and motivation among adolescents (Colom & Fernández, 2009).

To date, there are no studies that directly address the relationship between academic performance, emotional development, and the use of VLE among adolescents. However, relevant research has been identified in the university context. For instance, Horna & Seminario (2023) argue that students must assume an active and responsible role in their learning process to achieve satisfactory academic performance in virtual environments, with essential support from instructors. Additionally, Horna (2022) emphasizes the importance of designing digital platforms with students' needs in mind to promote inclusive education. Notably, 34% of students exhibit some resistance to the transition to virtual learning, attributing it to the perceived impersonality of these environments, which complicates their adaptation. Furthermore, 81% of students report that poor internet connectivity hinders the teaching-learning process. Caamal et al. (2022) identified that 85% of university students consider it essential to incorporate affectivity into the educational process and suggest that educators conduct more thorough monitoring of their students' academic performance.

To fully understand the nature and application of VLE, it is imperative to establish conceptual definitions that delineate their scope, characteristics, and purpose within the educational process. According to Gutiérrez (2018), a VLE is a set of computer tools that facilitate didactic interaction. Its main characteristics include:

- It constitutes a digital, non-physical environment generated and sustained by electronic technologies.
- It is hosted online, allowing remote access to its contents from any device with an internet connection.
- The programs and applications that comprise it provide support to both educators and students in their educational tasks.
- The pedagogical interaction it fosters is mediated by digital technologies, distinguishing it from traditional face-to-face teaching.

It is important to note that virtual learning environments are configured based on two fundamental dimensions: the technological and the educational. The technological dimension consists of tools and software applications that support educational proposals. While these tools may vary according to the type of VLE, they all fulfill essential functions such as facilitating interaction among group members, enabling the publication of materials, and organizing course development. Conversely, the educational dimension manifests in the teaching-learning process, highlighting that the VLE is not merely a technical space but also a human, social, and dynamic one. In this regard, it is based on the relationship between educators and students, whose primary objective is to collaboratively formulate and solve educational activities (Salinas, 2011).

In the school context, the most commonly used types of VLE include e-learning platforms, wikis, educational blogs, gamification platforms, and social networks. The differentiation between these environments lies in both the technological dimension and the didactic capabilities they offer, as they support various learning activities (Salinas, 2011; Meneses, 2024). These environments significantly enhance student learning and motivation, providing greater independence and flexibility, which enables better management of study time. Furthermore, they promote collaborative learning and constant communication among participants, as well as the possibility of being evaluated, evaluating others, and self-assessing (Gonzales & Granera, 2021).

Similarly, these virtual tools present numerous advantages for both educators and students. They facilitate the development of skills and competencies that are often difficult to achieve through traditional methods. In particular, these technologies allow students to search for, select, organize, and manage new information, thereby promoting autonomy in learning, a fundamental attitude for effective learning. They also increase intrinsic motivation, self-esteem, and the willingness to accept and understand different perspectives, fostering respect for others and their opinions (Gonzales & Granera, 2021).

In recent years, education has evolved towards a competency-based approach, prioritizing the holistic development of the student. This approach involves strengthening both cognitive and emotional skills, consistently promoting self-regulation and active participation in the lifelong learning process. In this sense, Bisquerra & Pérez (2007) define emotional competencies as a set of knowledge, capacities, skills, and attitudes necessary to understand, express, and appropriately regulate emotional phenomena. Therefore, Chabot & Chabot (2009) argue that emotional education facilitates the understanding and management of emotions, promoting both emotional intelligence and social skills. In turn, Bisquerra (2003) contends that this process strengthens personality by providing strategies to face daily challenges. In this same vein, Hernández (2005) highlights the close relationship between intellectual training and socio-affective development, thereby consolidating a truly comprehensive education.

On the other hand, Extremera & Fernández (2003) emphasize that professional success is not limited solely to academic intelligence; it also depends on the ability to manage both one's own emotions and those of others. In this regard, Cuartero (2007) argues that integrating emotions with reason during decision-making results in more balanced and wiser judgments than those based solely on intellect. Thus, emotions act as catalysts for motivation and action, complementing traditional cognitive processes.

Ibarrola (2009) delves deeper into this perspective, asserting that emotional intelligence influences at least 80% of life success, establishing a bidirectional relationship with cognitive intelligence. This approach is reinforced by Bisquerra (2005), along with Fernández & Extremera (2006), who underscore that contemporary education must transcend a purely academic focus to strengthen emotional strategies that enhance socio-affective development and optimize learning processes.

It is crucial to recognize that low academic performance and student dropout rates constitute global challenges, present even in culturally and economically similar contexts. To address these issues, universities need to adapt to the demands of the knowledge society, which involves redefining their educational objectives. According to Tejedor (2007), this requires strengthening generic competencies—such as cognitive, social, emotional, and ethical skills—to broaden the scientific and technical training of students.

In this context, Extremera & Fernández (2005) emphasize that emotions directly influence intellectual capacities, while cognitive functions can enhance learning, making it more effective and meaningful. Furthermore,

emotions serve as a driving force for social interaction and provide meaning to life experiences. Therefore, emotional competencies are increasingly relevant, impacting both academic success and the holistic personal development of students.

In light of this panorama, the central objective proposed is to analyze the effectiveness of virtual learning environments in academic performance and emotional development among university students, establishing a connection between the technological dimension and socio-affective skills in the current educational context.

Methodology

For the development of this research, a systematic review technique was adopted, recognized for its transparent and structured methodology for collecting, selecting, critically evaluating, and synthesizing the available evidence related to the research problem (Moreno et al., 2018). Specifically, an exhaustive search for articles and scientific documents was conducted in two prestigious academic databases: Scopus and Scielo.

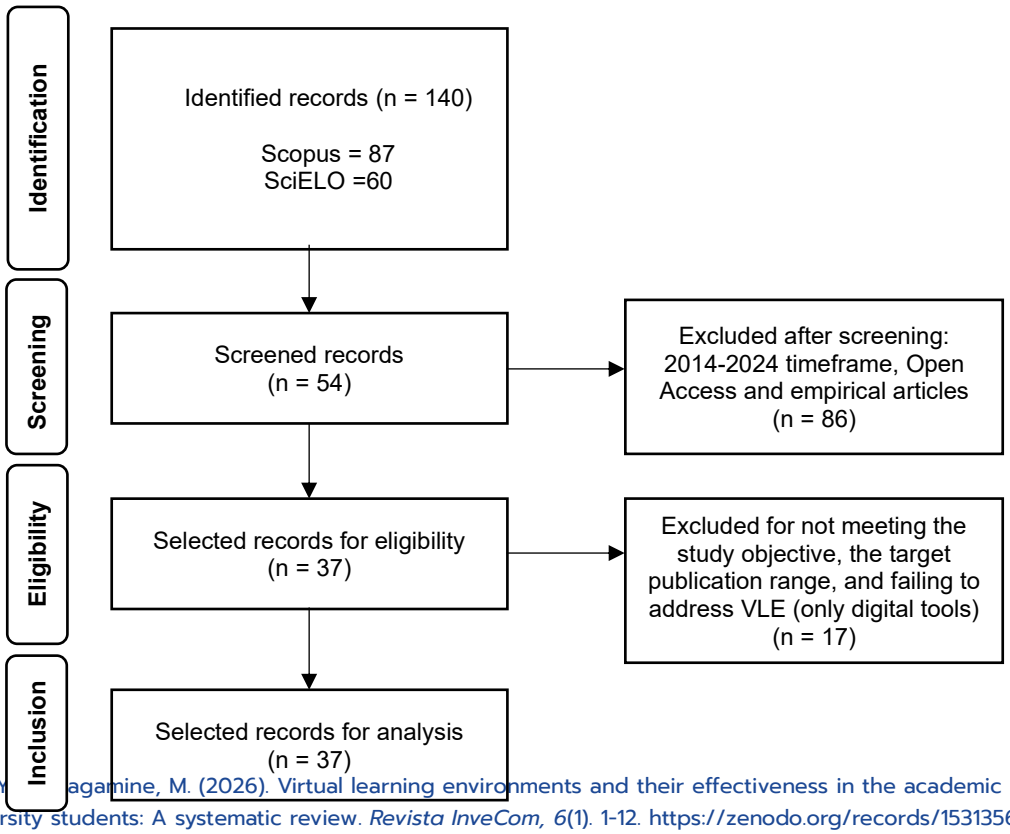
The process adhered to the PRISMA protocol, which ensured the replicability of the study. The updated items from PRISMA 2020 were particularly pertinent as it involved a systematic review of mixed methods, integrating both quantitative and qualitative approaches. Specific guidelines for presenting and synthesizing qualitative data were also followed (Page et al., 2021), ensuring methodological rigor in handling the information.

For the document search, key terms such as "virtual learning environments", "academic performance", "emotional" and "university students" were employed, combined using the Boolean operator AND. The inclusion criteria considered: documents published between 2014 and 2024, open access, and empirical articles analyzing VLE in relation to academic performance and emotional development among university students. Conversely, systematic reviews, book chapters, complete books, conference papers, and similar formats were excluded.

Initially, 140 relevant records were identified. After applying the inclusion/exclusion filters in the databases and conducting a preliminary reading of titles, 54 documents were selected. In a subsequent phase, the abstracts were analyzed—focusing on objectives, methodologies, and findings—allowing for the exclusion of 17 works for three main reasons: lack of thematic alignment with VLE, omission of the emotional component in their analysis, or failure to meet the established temporal range. Ultimately, 37 documents met all criteria and underwent comprehensive analysis.

Figure 1

Article selection procedure using PRISMA



Results and discussion

Table 1
Identified VLE based on data sample

ID	Authors	Virtual learning environment
A1	Deighton et al. (2019)	Virtual Learning Environment (VLE)
A2	Weiss et al. (2022)	Entorno de aprendizaje virtual
A3	Biasi et al. (2020)	Sdeonline y LimeSurvey
A4	Mesa-Rave et al. (2023)	Learning Management System (LMS) de Moodle
A5	Zamora-Polo et al. (2019)	Moodle
A6	Al-Zawqari et al. (2022)	Virtual Learning Environment - VLE
A7	Masood et al. (2024)	Open University Learning Analytics Dataset (OULAD)
A8	Maraza-Quispe et al (2022)	Moodle
A9	Aguagallo et al. (2023)	Sistema Institucional Integrado Universitario (SIIU)
A10	Esteban et al. (2021)	Virtual Learning Environments (VLEs)
A11	Wiboolyasarin (2023)	TalentLMS
A12	De Las Fuentes-Lara et al. (2024)	BlackBoard
A13	Palomares-Ruiz et al. (2020)	Campus virtual de la Universidad de Castilla-La Mancha (UCLM)
A14	Yang (2024)	Moodle
A15	Otifi et al. (2023)	Blackboard
A16	Utamachant et al. (2023)	i-Ntervene
A17	Rakow t al. (2023)	Moodle y Blackboard
A18	He et al. (2020)	Open University Learning Analytics Dataset (OULAD)
A19	Herrador-Alcaide et al. (2020)	Entorno Virtual de Aprendizaje – e-UNED
A20	Al-Azawei et al. (2020)	Virtual Learning Environment (VLE) de la Open University (OU)
A21	Aljohani et al. (2019)	Open University Learning Analytics Dataset (OULAD)
A22	Jawad et al. (2022)	Virtual Learning Environment (VLE)
A23	Li et al. (2021)	Ticademia
A24	Vásquez et al. (2023)	Moodle
A25	Martínez-Sarmiento & Gaeta (2019)	Moodle
A26	Pulgarín (2019)	Moodle
A27	Montagud & Gandía (2014)	Moodle
A28	Moya-Salazar et al. (2022)	Blackboard (Teams, Zoom, Meet)
B1	Caro et al. (2022)	Moodle
B2	Delport (2022)	eThuto
B3	Férez & Camacho (2020)	Entornos Virtuales de Aprendizaje (EVA)
B4	Guzmán et al. (2024)	Moodle
B5	Urquidi et al. (2019)	Moodle
B6	Lago et al. (2024)	Moodle, e-ducativa, Classroom, Teams, Edmodo
B7	Araya-Muñoz & Majano-Benavides (2022)	Moodle
B8	Bravo (2021)	Sistema de Gestión Académica (SGA)
B9	Borgobello et al. (2018)	Moodle

As evidenced in Table 1, a total of 37 scientific articles were analyzed, with 28 sourced from the Scopus database and 9 from Scielo. The analysis identified that Moodle is the most commonly used virtual learning environment (VLE) in the university context, with 13 studies highlighting it as the primary platform. Secondly, generic terms such as "Virtual Learning Environment" or the simplified designation "VLE" were noted in cases where no specific platform was mentioned.

Additionally, the existence of VLE with particular names tailored to the institutional characteristics of each university reflects the diversity in the implementation of these tools according to specific educational contexts.

VLE in academic performance and emotional aspects

The majority of the reviewed studies indicate that virtual learning environments (VLE) significantly contribute to improving academic performance (AP), particularly when there is high interaction and engagement from students with the available resources and activities, such as discussion forums and assessments. Al-Zawqari et al. (2022), Borgobello et al. (2018), and Deighton et al. (2019) underline that interaction with materials and activities within the VLE is a strong predictor of academic performance, noting that students who engage less tend to have higher dropout rates and lower academic self-efficacy. Similarly, studies by Maraza-Quispe et al. (2022), De Las Fuentes-Lara et al. (2024), Herrador-Alcaide et al. (2020), Al-Azawei et al. (2020), Aljohani et al. (2019), Jawad et al. (2022), and Wiboolyasarin (2023) have demonstrated that active participation in VLE translates into significant improvements in grades, confirming the positive relationship between the use of these platforms and academic performance.

Moreover, Aguagallo et al. (2023) reinforce this finding by demonstrating that 95% of the prediction of academic performance depends on the level of interaction with VLE resources, indicating that consistent participation is a key factor in educational success. In the same vein, Esteban et al. (2021) identified that students who complete a greater number of academic tasks within the platform achieve better results in their assessments. Additionally, De Las Fuentes-Lara et al. (2024) highlighted that the time dedicated to the VLE is crucial for achieving high grades in specific courses, while Montagud & Gandía (2014) confirmed this in the area of accounting. Palomares-Ruiz et al. (2020) evidenced significant improvements in the experimental group using the VLE compared to the control group (averaging 8.47 versus 7.78), a result similar to that reported by Martínez-Sarmiento & Gaeta (2019), who also noted improvements in grades within their study sample.

In this context, He et al. (2020) argue that active and continuous participation in the VLE is closely linked to academic success, reinforcing the idea that both the frequency of use and the quality of interaction with the platform are essential for effective learning. Broader studies, such as those by Caro et al. (2022) and Férez & Camacho (2020), confirm that students with higher participation in VLE achieve better grades. Furthermore, Urquidi et al. (2019) add that the use of these environments not only improves performance but also fosters autonomy, self-efficacy, and motivation, enriching the learning experience. However, it is important to consider that positive outcomes in academic performance may depend on intermediate variables such as motivation, the quality of tutoring, and accessibility (Biasi et al., 2020), as well as the implementation of classroom projects and co-evaluation (Mesa-Rave et al., 2023). In particular, the quality of tutoring emerges as a key element to prevent frustrations (Biasi et al., 2020). Utamachant et al. (2023) contend that while basic programming exercises showed improved performance, VLE were less effective for more complex topics.

These findings align with research affirming the positive impact of VLE on academic success. For example, the study by Díaz et al. (2023) shows that active participation in a virtual classroom translates into better results in assessments of mathematical functions, supporting the relationship between performance on the platform and academic test results. Lunavictoria et al. (2021) highlight the relevance of virtual tutoring in improving the academic performance of university students. Additionally, the use of technological tools in VLE has proven to generate high levels of satisfaction and a positive perception among students, thanks to automated feedback and personalized learning.

On the other hand, VLE have not only proven effective in promoting academic performance but have also contributed to strengthening motivation, resilience, and confidence, while reducing academic stress. Yang (2024) identified that the use of Moodle enhanced student self-efficacy and engagement. Similarly, Pulgarín (2019) found that implementing Moodle in reading and text analysis instruction positively impacted student confidence and reduced stress and anxiety levels, creating a more comfortable and less threatening learning environment. In another context, Guzmán et al. (2024) observed that using VLE strengthened resilience and developed empathy, suggesting that these environments can help cultivate essential socio-emotional skills for both education and professional life. Urquidi et al. (2019) highlighted that students perceived the use of VLE as improving their

autonomy, self-efficacy, motivation, and confidence. Additionally, the clarity of resources and the inclusion of playful elements motivated student effort (Li et al., 2021). While there is a positive appraisal of VLE-mediated learning, some studies indicate that students still prefer face-to-face interaction (Araya-Muñoz & Majano-Benavides, 2022).

However, despite the positive results, other studies have found no significant correlation between the use of these platforms and the proposed variables, indicating that the use of VLE does not always guarantee improvements in student performance. For example, Zamora-Polo et al. (2019) argued that, emotionally, the impact of the VLE was neutral, showing no clear trend toward improvement or deterioration in performance. Similarly, Vásquez et al. (2023) did not identify a significant relationship between VLE usage and academic performance, although they noted negative emotional effects, such as stress and anxiety in some students. Additionally, Delport (2022) reported that the impact of the VLE was limited due to accessibility issues, preventing students from fully benefiting from the platform.

One of the main challenges for VLE arises in practical and laboratory courses, where lack of accessibility and technical difficulties negatively affect both academic performance and student well-being. Delport (2022) identified that the effectiveness of the VLE was limited due to internet access issues and technological equipment, preventing many students from actively participating in virtual activities, which impacted their academic results. Lago et al. (2024) agreed, noting that not all students adapted to VLE, especially in courses requiring practical work and laboratory use, adversely affecting their academic performance. Their study also highlighted that virtuality weakened emotional ties and sociability among students, reducing the collaborative interaction essential for these types of learning. In a similar vein, Bravo (2021) found that the lack of clear instructions and the use of rubrics without direct interaction with teachers negatively impacted academic performance, aligning with findings from Weiss et al. (2022) and Moya-Salazar et al. (2022), who reported increased stress, anxiety, fear, and demotivation.

This issue is compounded by findings from Masood et al. (2024) and Aguagallo et al. (2023), who discovered that lack of interaction in VLE generates demotivation and stress. Rakow et al. (2023) emphasized that ineffective communication in VLE and the absence of digital skills among teachers affect student autonomy. Likewise, Bravo (2021) reiterated that the absence of teacher interaction and clear instructions increases anxiety and demotivation, while Lago et al. (2024) confirmed that virtuality weakened student sociability. Otifi et al. (2023) identified that VLE generated mixed feelings among students, balancing satisfaction from flexibility with anxiety due to technical problems. Ultimately, it was established that students with lower academic levels are more prone to dropping out in virtual environments (Utamachant et al., 2023).

Conclusions

This systematic review has highlighted that virtual learning environments have diverse impacts on both academic performance and emotional development among university students. On one hand, numerous studies underscore the positive potential of VLE to enhance academic performance, thanks to the flexibility, accessibility, and interactive resources they offer. Additionally, their contribution to the development of socio-emotional skills, such as autonomy, effective time management, and collaboration, are fundamental aspects of holistic learning.

However, research also identifies limitations associated with VLE effectiveness, pointing to challenges such as the lack of face-to-face interaction between teachers and students, technical difficulties, internet accessibility issues, and potential cognitive overload. These factors can negatively affect both academic performance and student well-being, increasing academic stress and anxiety.

In light of these findings, it is evident that the effectiveness of VLE is not universal but depends on multiple contextual factors, such as course design, the quality of learning materials, institutional support, and individual student characteristics, including motivation and self-learning skills. Moreover, the support and monitoring provided by tutor instructors, along with their adequate training for using these environments, are key elements in ensuring a successful educational experience. It is essential for educators to implement strategies and virtual resources that accompany students in their learning process and help prevent university dropout.

Consequently, future research should delve deeper into analyzing these moderating factors to better understand the conditions that optimize the use of VLE. It is also important for higher education institutions to implement these environments within a pedagogical framework aimed at enhancing both learning and the holistic development of students. Based on the results obtained, exploring gamification platforms and the use of social networks as alternative and complementary spaces for technology-mediated learning emerges as a promising line of research.

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