



Gamification as a cross-cutting strategy to improve student motivation and academic performance

Gamificación como estrategia transversal para mejorar motivación y rendimiento académico estudiantil

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ABSTRACT

Educational gamification has emerged as an innovative pedagogical strategy to address contemporary challenges in student motivation and academic performance. The research objective is to analyse the effectiveness of gamification in improving student motivation and academic performance. This study adopted a qualitative approach based on a systematic review of specialised literature, analysing empirical research published between 2021 and 2025 that evaluated gamified implementations in diverse educational contexts. The results consistently demonstrate that the strategic integration of playful elements generates significant improvements: 23% increases in higher education grades and 18% increases in basic education grades. Gamification strengthens three key motivational components: perceived autonomy, academic competence, and social connection, while reducing academic anxiety. Successful implementations require rigorous instructional design, alignment with clear pedagogical objectives, and adaptability to diverse student profiles. Therefore, gamification represents a valuable tool for contemporary pedagogical transformation.

Descriptors: pedagogical methods; motivation; teacher training. (Source: UNESCO Thesaurus).

RESUMEN

La gamificación educativa ha emergido como una estrategia pedagógica innovadora para abordar los desafíos contemporáneos de motivación y rendimiento académico estudiantil. El objetivo de investigación consiste en analizar la efectividad de la gamificación para mejorar la motivación y el rendimiento académico estudiantil. Este estudio adoptó un enfoque cualitativo basado en revisión sistemática de literatura especializada, analizando investigaciones empíricas publicadas entre 2021 y 2025 que evaluaron implementaciones gamificadas en contextos educativos diversos. Los resultados demuestran consistentemente que la integración estratégica de elementos lúdicos genera mejoras significativas: incrementos del 23% en calificaciones de educación superior y 18% en educación básica. La gamificación fortalece tres componentes motivacionales clave: autonomía percibida, competencia académica y conexión social, mientras reduce la ansiedad académica. Las implementaciones exitosas requieren diseño instruccional riguroso, alineación con objetivos pedagógicos claros y adaptabilidad a perfiles estudiantiles diversos. Por tanto, la gamificación representa una herramienta valiosa para la transformación pedagógica contemporánea.

Descriptores: métodos pedagógicos; motivación; preparación de profesores. (Fuente: Tesauro UNESCO).

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Research articles



INTRODUCTION

Contemporary education faces constant challenges in maintaining student interest and optimising learning processes. Traditionally, pedagogical methodologies have focused on expository approaches which, although effective in certain contexts, have limitations in capturing the attention of digital generations (Navarro-Mateos et al., 2021). In this landscape, gamification emerges as an innovative alternative that integrates playful elements into formal educational environments.

Several recent studies have documented the transformative potential of this strategy. According to Cuenca-Córdova & Vivanco-Ureña (2025), the implementation of game mechanics in formative assessments generates measurable positive impacts on university academic performance. Similarly, Fiestas-Mejía & Founes-Mendez (2023) demonstrate substantial improvements in the performance of primary school students when gamified strategies are applied systematically.

The relevance of this research lies in the need to understand how gamification can be articulated as a cross-cutting strategy, transcending specific educational levels to establish itself as a comprehensive methodology. Consequently, the research objective is to analyse the effectiveness of gamification in improving student motivation and academic performance.

Theoretical references

Educational gamification represents an emerging pedagogical paradigm that transcends the superficial application of playful elements in academic contexts, constituting a transformative methodology that redefines the relationships between educator, student, and knowledge. This methodological approach is based on psychological, neurological, and didactic principles that form a complex



system of educational intervention, integrating cognitive, affective, social, and metacognitive dimensions of comprehensive human development.

The contemporary conceptualisation of educational gamification is anchored in the understanding of play as a fundamental human activity, recognising its potential to generate meaningful, lasting and transferable learning. This perspective goes beyond instrumentalist views that reduce gamification to the mere incorporation of points, badges or rankings, embracing a systemic understanding that recognises the complexity inherent in contemporary teaching-learning processes.

As documented by Cuenca-Córdova & Vivanco-Ureña (2025), the integration of gamified elements into formative assessment produces substantial transformations in student academic performance, demonstrating that this methodology constitutes a systemic approach capable of reformulating traditional teaching-learning processes. Their research reveals that gamification not only impacts quantitative performance indicators, but also qualitatively transforms the educational experience, generating higher levels of student engagement, persistence, and satisfaction.

The transformative dimension of educational gamification is manifested in its ability to create learning ecosystems where intrinsic motivation is cultivated through the careful design of experiences that respect student autonomy, provide appropriate challenges, and facilitate the collaborative construction of knowledge. This approach recognises that effective learning occurs when students become active protagonists in their own education, taking on roles as researchers, creators, and collaborators in meaningful communities of practice.

In this regard, Fiestas-Mejía & Founes-Mendez (2023) demonstrate that strengthening gamified strategies in basic education not only optimises academic performance but also develops cross-cutting skills essential for the knowledge society, including critical thinking, effective collaboration, self-regulation of



learning, creativity, assertive communication, and the ability to adapt to changing contexts.

Impact on academic performance

Recent research provides multifaceted evidence of the positive impact of gamification on student academic performance, documenting improvements in multiple dimensions of learning. As documented by Lima-Quinde et al. (2025), gamified interventions generate significant improvements not only in traditional quantitative grades, but also in complex qualitative indicators such as active class participation, persistence in the face of academic difficulties, transfer of learning to new problem contexts, development of metacognitive skills, and construction of positive academic identities.

Longitudinal studies reveal that the positive effects of gamification on academic performance are sustained over time when interventions are designed systemically and implemented in a sustained manner. Students who participate in well-designed gamified experiences demonstrate greater knowledge retention, better application of concepts in novel situations, and superior development of critical thinking skills compared to students in traditional educational settings.

The differential impact of gamification according to specific student characteristics reveals that this methodology particularly benefits students with academic motivation difficulties, students with kinesthetic or visual learning styles, and students from disadvantaged socioeconomic backgrounds who find opportunities for academic success in gamified environments that they might not experience in traditional educational contexts.

Systematic reviews of the field

Through a comprehensive systematic review analysing more than two hundred empirical studies, Prieto-Andreu et al. (2022) confirm the positive relationship



between gamification, student motivation and educational performance, although they identify the need for greater methodological rigour in future research to establish more definitive causal relationships. Their conclusions emphasise that the positive effects of gamification are maximised when it is implemented in a systematic and sustained manner, integrating organically with specific curricular objectives, rather than being applied as a one-off or superficial intervention.

The meta-analysis reveals moderate to large effect sizes in variables such as intrinsic motivation, student engagement, and satisfaction with the learning experience, while the effects on academic performance measured through standardised assessments show considerable variability depending on the specific design of the gamified intervention.

For their part, Navarro-Mateos et al. (2021) document the state of gamification in Spanish education through a systematic analysis of implementations at different educational levels, identifying promising emerging trends and challenges that require attention from researchers and practitioners. Their analysis reveals that the most successful implementations integrate gamified elements with innovative pedagogical methodologies such as project-based learning, flipped classrooms, collaborative learning, and critical pedagogies that empower students as co-constructors of their educational experience.

Minecraft Education as a paradigm

In a comprehensive systematic review analysing more than fifty empirical studies, Lardín et al. (2023) analyse the use of Minecraft Education as an educational gamification tool, identifying its unique potential for developing STEM skills, creativity, interpersonal collaboration, spatial thinking, complex problem solving, and responsible digital citizenship. The platform provides immersive three-dimensional environments where students build, experiment, collaborate authentically, and participate in simulations that transform abstract concepts into concrete, manipulable, and meaningful experiences.



Research documents that Minecraft Education facilitates the learning of complex mathematical concepts through the construction of geometric structures, the exploration of proportions and scales, and the solving of problems that require precise calculation and measurement. In science, the platform allows for the creation of ecosystem models, simulations of physical phenomena, and virtual experiments that complement traditional laboratory experiences.

The collaborative dimension of Minecraft Education emerges when students work on collective construction projects that require coordinated planning, division of labour, effective communication, and collaborative conflict resolution. These experiences develop social and leadership skills that transcend the digital context, preparing students for effective collaboration in future professional contexts.

Virtual strategies for logical-mathematical thinking

Through a rapid but comprehensive review of the emerging specialised literature, Pazmiño-Arcos et al. (2024) document the development and evaluation of gamified virtual strategies specifically designed to strengthen students' logical-mathematical thinking at different educational levels. Their results indicate that gamified digital tools provide unique opportunities for the interactive visualisation of abstract mathematical concepts, the dynamic exploration of complex numerical relationships, the development of diversified problem-solving strategies, and the progressive construction of solid mathematical intuitions.

Effective virtual applications for the development of logical-mathematical thinking include visual programming environments where students create algorithms to solve mathematical problems, simulators of physical phenomena that require mathematical modelling, strategy games that develop logical reasoning, and visualisation platforms that allow interactive manipulation of abstract mathematical objects.

Virtual and augmented reality in education



Virtual and augmented reality technologies are emerging as powerful tools for creating immersive gamified experiences that transcend the limitations of traditional educational environments. These technologies enable the creation of virtual worlds where students can explore historical civilisations, manipulate molecules at the atomic scale, travel through the solar system, or participate in laboratory simulations that would be impossible or dangerous in the real world.

Augmented reality superimposes digital information onto the real world, creating hybrid experiences where students can interact with virtual objects in real contexts, solve treasure hunts that combine physical exploration with digital problem solving, and participate in collaborative experiences that connect physical and virtual spaces in innovative ways.

Gamification in early childhood education

With regard to teaching strategies in early childhood education, Montañó & Enríquez (2022) emphasise the critical importance of adapting gamified strategies to the specific developmental characteristics of different age groups, recognising that the cognitive, emotional, and social development of young children requires specialised pedagogical approaches that respect their unique developmental needs. In early childhood education, gamification should prioritise rich sensory elements that stimulate multiple perceptual modalities, immersive narratives that connect with children's imaginations, and opportunities for free exploration that respect the natural patterns of cognitive and socio-emotional development characteristic of this fundamental stage.

Effective gamified strategies for early childhood education include construction activities that develop fine motor skills and spatial thinking, role-playing games that foster socio-emotional development and understanding of others' perspectives, artistic activities that stimulate creativity and personal expression, and sensory explorations that connect abstract learning with concrete and meaningful experiences.



The design of gamified experiences for early childhood education must carefully consider the duration of activities, avoiding overstimulation that can lead to cognitive fatigue, incorporating smooth transitions between different types of activities, and providing multiple opportunities for physical movement, which is essential for the comprehensive development of young children.

Video games and preschool development

From a specific preschool development perspective, Ramírez-Benavides (2024) examines the strategic use of educational video games for the development of logical-mathematical thinking in preschool students, identifying specific design principles that optimise early learning without compromising healthy development. Research reveals that well-designed educational video games can serve as effective mediators for the construction of fundamental mathematical concepts, providing visual and manipulable representations of abstract ideas that are accessible to developing minds.

Effective video games for preschool development incorporate simple and intuitive game mechanics that do not require complex motor skills, provide immediate and positive feedback that reinforces learning, include narrative elements that connect with children's interests, and allow for repetition without monotony through gradual variations in difficulty and context.

Comprehensive analysis of contemporary implementations

Through a comprehensive analysis of the current state of the art, examining more than three hundred documented implementations in different educational contexts, Márquez-Ramírez & Angulo-Armenta (2024) provide a comprehensive perspective on gamification in contemporary teaching practices, identifying both established achievements that demonstrate the effectiveness of these methodologies and challenges that remain to be resolved and require urgent research and practical attention. Their analysis reveals that the successful implementation of gamified strategies requires specialised and sustained teacher



training, committed and long-term institutional support, systematic evaluation of educational outcomes using multiple metrics, and an organisational culture that values pedagogical innovation and calculated educational risk.

Emerging trends identified include the integration of artificial intelligence for adaptive personalisation of learning experiences, the use of learning analytics to optimise the design of gamified mechanics, the incorporation of mixed reality elements that combine physical and virtual spaces, and the development of teaching communities of practice that share resources and implementation strategies.

METHOD

This study adopted a qualitative approach based on a systematic review of specialised literature. The methodological strategy comprised a critical analysis of recent scientific publications, prioritising empirical research that evaluated gamification implementations in diverse educational contexts.

The bibliographic selection criteria included: studies published between 2021 and 2025, research that addressed educational gamification as the main variable, quantitative or mixed methodologies that presented data on academic performance or student motivation, and publications in Spanish that allowed for contextualised analysis for Ibero-American realities.

Information collection was structured using analytical matrices that categorised variables such as educational level, type of gamification implemented, evaluation metrics used, and results obtained. Subsequently, a comparative analysis was performed to identify recurring patterns and emerging trends in the application of gamified strategies.

RESULTS

The research analysed consistently demonstrates that gamification generates significant improvements in student performance. Lima-Quinde et al. (2025)



report average increases of 23% in higher education student grades when point systems, levels, and virtual rewards are implemented. These results remain stable regardless of academic discipline, suggesting that effectiveness transcends specific areas of knowledge.

In basic education contexts, Fiestas-Mejía & Founes-Mendez (2023) document 18% improvements in standardised assessments when curriculum content is presented through playful mechanics. In particular, mathematics and science show the greatest increases, possibly due to the structured nature of these disciplines, which facilitates the implementation of progressive elements characteristic of games.

The data suggests that the impact on academic performance is directly related to the duration of the gamified intervention. Short-term implementations (less than four weeks) show more modest effects, while those that extend over entire academic terms generate more profound and lasting transformations in learning outcomes.

Significantly, improvements in performance are not limited to traditional quantitative metrics. Studies reveal parallel increases in cross-cutting skills such as critical thinking, collaborative problem solving, and applied creativity. This multidimensionality of impact suggests that gamification activates complex cognitive processes that transcend superficial memorisation.

Transformation of student motivation

The motivational dimension is the most significant aspect of educational gamification. Prieto-Andreu et al. (2022) identify three motivational components that are consistently strengthened: perceived autonomy, academic competence, and social connection. Students report greater control over their learning process when they can choose paths of progress, set personalised goals, and visualise progress through immediate feedback systems.



Similarly, Márquez-Ramírez & Angulo-Armenta (2024) highlight that gamification significantly reduces academic anxiety, particularly in assessments. The "second chance" and incremental progress mechanisms characteristic of games allow students to perceive mistakes as learning opportunities rather than definitive failures.

Intrinsic motivation undergoes particularly notable transformations when gamified elements align with students' personal interests. Thematic narratives that connect academic content with individual passions generate higher levels of engagement than generic implementations. This motivational personalisation suggests the importance of considering individual psychological profiles in the design of gamified experiences.

Longitudinal studies reveal that motivational effects tend to experience cyclical fluctuations. Initial motivation may decrease during intermediate periods of implementation, requiring renewal and diversification of playful elements to maintain student interest. This temporal variability highlights the need to design adaptive and evolutionary gamified systems.

Technological implementation and digital resources

Technological integration is a fundamental component for the success of gamified strategies. Lardín et al. (2023) specifically analyse the use of Minecraft Education, demonstrating that specialised gamified platforms generate greater engagement than superficial adaptations of playful elements in traditional environments.

Complementarily, Pazmiño-Arcos et al. (2024) evaluate virtual strategies for the development of logical-mathematical thinking, finding that digital gamification facilitates the personalisation of learning and allows automatic adaptation to different student paces. These gamified virtual environments offer advantages such as detailed progress tracking, algorithmic adaptability, and institutional scalability.



Educational analytics is emerging as a differentiating component of successful technological implementations. Digital gamified systems can capture granular data on learning behaviours, interaction patterns, and individual preferences. This information allows for continuous optimisation of the educational experience, identifying elements that require adjustment or modification.

However, the digital divide is a significant limiting factor. Disparities in technological access and digital skills can amplify existing educational inequalities, particularly in disadvantaged socio-economic contexts. This reality underscores the importance of developing gamified alternatives that do not rely exclusively on advanced technology.

Demographic and cultural factors

Demographic analyses reveal substantial variations in the effectiveness of gamified strategies according to specific population characteristics. Gender differences show interesting patterns: while female students respond favourably to collaborative and narrative elements, male students tend to prefer competitive and individual achievement mechanics.

Age is another significant moderating variable. Younger students (primary education) show more immediate and enthusiastic responses to gamified elements, while older students require more sophisticated implementations that respect their autonomy and cognitive maturity.

Cultural considerations are an often underestimated aspect in the reviewed literature. Gamified elements that work effectively in Western contexts may generate resistance or confusion in cultures with different relationships to competitiveness, hierarchy, and individual expression. This cultural variability suggests the need for specific contextual adaptations.

Challenges and limitations identified



Despite the positive results, the research also reveals significant challenges. Navarro-Mateos et al. (2021) identify that superficial or poorly designed implementation of gamified elements can generate counterproductive effects, reducing intrinsic motivation when students perceive manipulation or artificiality in the mechanics employed.

Similarly, Morales-Pérez & Reyes-Cardona (2022) point to disparities in effectiveness according to student demographic characteristics. The results suggest that factors such as technological access, familiarity with digital environments, and individual learning preferences significantly modulate the impact of gamified interventions.

Economic sustainability represents another significant institutional challenge. Successful gamified implementations require considerable investment in technology, teacher training, and content development. Many educational institutions face budgetary constraints that hinder the adoption and maintenance of complex gamified systems.

Teacher resistance is a frequently documented barrier. Educators who lack experience with digital technologies or hold traditional views about academic seriousness may be reluctant to embrace gamified methodologies. This resistance can sabotage well-designed implementations if it is not addressed through specific training and awareness programmes.

Differential effectiveness analysis

Comparative analysis of different gamified modalities reveals patterns of differential effectiveness depending on specific contexts. Hybrid implementations that combine digital and physical elements show superior results to exclusively virtual or analogue approaches.



Extrinsic reward systems (points, badges, rankings) generate immediate motivational effects but can weaken intrinsic motivation in the long term if not carefully balanced with elements that promote autonomy and personal purpose.

Immersive narrative mechanics prove particularly effective in maintaining sustained engagement. Students who participate in gamified experiences with coherent stories and developed characters report greater emotional connection to academic content and superior retention of acquired knowledge.

DISCUSSION

The data analysed confirms the transformative potential of gamification as a comprehensive pedagogical strategy. However, its effectiveness depends crucially on the quality of instructional design and the alignment between game mechanics and specific educational objectives.

A recurring pattern in successful research is the gradual and systematic implementation of gamified elements, in contrast to attempts at radical transformation that often generate student resistance or confusion. Montañó & Enríquez (2022) suggest that gamification works best as a complement to solid pedagogical methodologies, rather than as a complete substitute for established educational practices.

The social dimension emerges as a determining factor for success. Strategies that incorporate collaborative elements, healthy competition, and social recognition show superior results to purely individual implementations. This suggests that effective gamification must consider the inherently social nature of human learning.

Regarding the sustainability of effects, longitudinal research indicates that motivational benefits tend to stabilise after initial periods of novelty. Therefore, successful gamification requires constant evolution and renewal of playful elements to maintain long-term student engagement.



Pedagogical implications

The results suggest that successful gamification requires a paradigm shift in the conceptualisation of the teaching role. Educators must transition from positions of transmissive authority to roles as facilitators and designers of experiences. This transformation involves the development of technological skills, an understanding of motivational psychology, and experiential design skills.

Assessment in gamified contexts also requires reconceptualisation. Traditional assessment methods may be incongruous with pedagogical philosophies centred on process, collaboration, and experimentation. Assessment tools are needed that capture cross-cutting skills, individual progress, and social learning.

Personalisation emerges as a fundamental guiding principle. Successful gamified systems must adapt to diverse learning styles, individual paces, and specific motivational preferences. This personalisation requires technological sophistication and a deep understanding of individual student differences.

Ethical considerations

The implementation of gamified strategies raises important ethical questions related to behavioural manipulation and student privacy. Systems that collect detailed data on learning behaviours must balance educational personalisation with the protection of sensitive information.

Educational equity represents another fundamental ethical consideration. Gamified implementations should not amplify existing disadvantages related to technological access, digital skills, or family economic resources. Inclusive designs that offer multiple paths to participation and success are required.

CONCLUSION

Gamification represents a promising pedagogical strategy for improving both student motivation and academic performance. The results analysed consistently



demonstrate that the strategic integration of playful elements in educational contexts generates measurable and sustained benefits.

Successful implementations share common characteristics: rigorous instructional design, alignment with clear pedagogical objectives, incorporation of collaborative social elements, and adaptability to different student profiles. Conversely, failures are often associated with superficial applications that prioritise entertainment over effective learning.

For future research, it is recommended to develop longitudinal studies that evaluate the sustainability of motivational effects, explore culturally sensitive adaptations of gamified mechanics, and analyse the differential impact according to student socioeconomic characteristics. Similarly, it is necessary to investigate teacher training methods that facilitate the effective implementation of gamified strategies in diverse educational contexts.

Teacher training is a determining factor in the success of gamified implementations. Professional development programmes should address both technical skills and theoretical understanding of motivational principles and experiential design. Without adequate preparation, even the best-designed gamified systems may fail to generate the expected educational benefits.

In short, educational gamification is a valuable tool for contemporary pedagogical transformation, with the potential to reconcile the expectations of digital generations with the educational objectives of traditional educational institutions. Its successful implementation requires a deep understanding of psychological principles, careful design of experiences, and institutional commitment to educational innovation.

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