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Gamification and Universal Design for Learning (UDL): Inclusive Strategies to Enhance Motivation and Academic Performance in Diverse Educational Settings

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Abstract

This study analyzes the impact of integrating gamification and Universal Design for Learning (UDL) as inclusive strategies to enhance motivation and academic performance in diverse educational settings. The research followed a mixed-methods approach, combining a non-experimental quantitative correlational design with a qualitative descriptive-interpretative component. The sample consisted of 120 upper basic and high school students from urban institutions in Ecuador, who participated in an eight-week pedagogical intervention based on gamified activities structured under UDL principles. Data collection involved Likert-scale questionnaires, academic records, semi-structured interviews, and non-participant classroom observation. Results showed a significant increase in students' motivation levels, with improvements across cognitive, affective, and behavioral dimensions. Additionally, the average grades rose by 14%, and a positive and significant correlation was found between motivation and academic performance ($r = 0.72$, $p < 0.01$). Qualitative findings complemented these outcomes, highlighting students' perceptions of inclusion, enthusiasm, and active participation. In conclusion, the convergence of gamification and UDL emerges as an effective pedagogical strategy to promote inclusive education by fostering student engagement, diversifying learning experiences, and supporting academic success in heterogeneous contexts.

Keywords: *Gamification; Universal Design for Learning; Inclusive education; Motivation; Academic performance.*

Introduction

Inclusive education currently represents one of the main challenges faced by educational systems, as it seeks to ensure that all students—regardless of their personal, social, or cultural conditions—have equal opportunities for learning and academic success. To address this demand, Universal Design for Learning (UDL) has been consolidated as a pedagogical framework that promotes curriculum flexibility and resource diversification, with the aim of removing barriers and fostering the participation of students with different learning styles and paces (CAST, 2018; Navarro & López, 2021). In this sense, UDL fosters not only equity but also the personalization of teaching, which is a fundamental aspect in increasingly heterogeneous classrooms.

At the same time, gamification has emerged as an innovative strategy that incorporates game mechanics, dynamics, and aesthetics—such as challenges, rewards, levels, and narratives—into the educational context, with the purpose of stimulating students' motivation and engagement (Deterding et al., 2011; Werbach & Hunter, 2020). Recent studies have shown that gamification increases intrinsic motivation, enhances self-regulated learning, and improves interactions between students and teachers (Martínez-González & Vega-Hernández, 2020; Subhash & Cudney, 2022). Moreover, a positive relationship has been observed between the implementation of gamified environments and academic performance, as students tend to engage more deeply in meaningful activities when they perceive a playful component (Mora et al., 2021).

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The articulation of UDL and gamification opens a space for pedagogical innovation, since both approaches aim to diversify learning experiences and ensure active participation in diverse contexts. UDL provides the theoretical framework to design accessible and flexible environments, while gamification offers tools to increase motivation and engagement. However, specialized literature reveals that studies analyzing the integration of both approaches remain scarce and lack systematization, which constitutes a relevant research gap (Al-Azawi et al., 2022; Rodríguez & Rodríguez, 2023).

Three key gaps can be identified at this stage. First, most studies on gamification have focused on motivational and performance outcomes, but without explicitly considering UDL accessibility principles, which limits the understanding of its impact in inclusive contexts. Second, studies applying UDL rarely incorporate game dynamics into curricular design, and therefore do not report how motivation and engagement are affected. Finally, recent systematic reviews agree that there is methodological fragmentation, with short-term designs, heterogeneous instruments, and limited data triangulation (Jaramillo-Mediavilla et al., 2024; Mora et al., 2021; Navarro & López, 2021).

Thus, the present study stands out by offering three original contributions: (a) an explicit integration between UDL principles (representation, action/expression, engagement) and gamification elements (challenges, badges, immediate feedback, narratives); (b) a mixed-methods approach with triangulation of quantitative and qualitative instruments, which includes not only motivation and academic performance but also perceptions of inclusion and participation; and (c) an analysis in a Latin American context, underrepresented in the literature, thereby broadening the external validity of the findings.

Within this framework, the objective of this article is to analyze the impact of gamification and Universal Design for Learning on the motivation and academic performance of students in diverse educational settings. The aim is to contribute empirical evidence and critical reflections that can guide teaching practice and the design of inclusive policies, thereby strengthening inclusive education in the digital era.

Materials and Methods

Research Approach and Design

The study was conducted under a mixed-methods approach, combining a non-experimental quantitative correlational design with a qualitative descriptive-interpretative component. This design allowed not only for the statistical measurement of the impact of gamification and UDL on motivation and academic performance but also for an in-depth understanding of participants' perceptions and experiences, thereby achieving more robust methodological triangulation (Creswell & Plano Clark, 2018).

Context and Participants

The research was carried out in upper basic and high school institutions in urban areas of Ecuador during the 2025–2026 academic year. The total population consisted of approximately 350 students, from which a purposive non-probabilistic sample of 120 students was selected (60 from upper basic and 60 from high school). The use of this sampling technique responded to the need to involve participants who would be systematically exposed to an eight-week pedagogical intervention.

Although the non-probabilistic sampling limits the generalizability of results, heterogeneity in terms of gender, socioeconomic level, and learning styles was sought to ensure contextual representativeness. Nevertheless, the possibility of selection bias is acknowledged, which constitutes a methodological limitation.

Validity and Reliability of Instruments

Academic Motivation Questionnaire: designed based on previously validated scales adapted to the Latin American context. It underwent a content validation process by three experts in inclusive education and educational technology. In a pilot test with 30 students, Cronbach's $\alpha = 0.87$ was obtained, indicating high internal consistency.

Official Academic Records: used as an objective measure of performance, ensuring external validity of results.

Semi-structured Interviews: validated by pedagogy experts to ensure relevance and clarity of the questions.

Observation Checklists: developed with predefined categories (collaboration, participation, enjoyment), reviewed by two researchers to ensure inter-rater reliability (agreement index = 0.82).

Qualitative Analysis

The qualitative data analysis was conducted using Atlas.ti version 23, following a three-stage coding process:

1. *Open Coding*: identification of meaning units from interview transcripts and observation records, generating 68 initial codes.
2. *Axial Coding*: grouping of codes into 12 subcategories, such as intrinsic motivation, perceived inclusion, collaboration, feedback, and enjoyment.
3. *Selective Coding*: final integration into three emergent categories: perception of inclusion, increase in motivation, and diversification of learning.

Theoretical saturation was reached with the interviews conducted (12 students and 6 teachers), ensuring sufficiency and interpretative robustness of the findings.

Ethical Considerations

The study adhered to the Declaration of Helsinki (2013) and obtained informed consent from participants and their legal guardians. Anonymity, confidentiality of data, and exclusive academic use of the information were guaranteed.

Table 1: **Operationalization of Variables**

Variable	Dimensions	Indicators	Techniques	Instruments
Independent: Inclusive Strategies (Gamification and UDL)	**Gamification**	- Use of playful dynamics (points, challenges, levels, badges). - Incorporation of motivating narratives. - Immediate feedback.	Non-participant observation Survey	Observation checklist Likert-type questionnaire
	Universal Design for Learning (UDL)	- Principle of representation (diversity of resources: visual, auditory, kinesthetic). - Principle of action and expression (variety in ways of demonstrating learning). - Principle of engagement (autonomy, choice, personal relevance).	Observation Semi-structured interview	Observation checklist Interview guide
Dependent 1: Academic Motivation	**Cognitive**	- Interest in activities. - Sustained attention.	Survey Interview	Likert-type questionnaire Interview guide
	Affective	- Enjoyment and enthusiasm for tasks. - Positive attitudes toward learning.	Survey Observation	Likert-type questionnaire Observation checklist
	Behavioral	- Constant effort. - Voluntary participation. - Completion of activities.	Survey Observation	Likert-type questionnaire Observation checklist

Dependent 2: Academic Performance	**Academic Achievement**	- Grades obtained. - Progress compared to baseline evaluations.	Documentary analysis	Academic records
	Classroom Participation	- Frequency of interventions. - Collaboration in group work.	Observation	Observation checkl

Results

Academic Motivation Before and After the Intervention

The implementation of gamification and UDL showed a significant increase in students' motivation levels. The overall mean rose from M = 3.1, SD = 0.72 in the pretest phase to M = 4.2, SD = 0.58 in the posttest.

The paired-samples *t*-test confirmed that the difference was statistically significant ($t(119) = 12.47$, $p < .001$, 95% CI [0.89, 1.25]).

Table 1: Comparison of Academic Motivation Pre- and Post-Intervention (Likert Scale 1–5)

Dimension	Pretest (M ± SD)	Posttest (M ± SD)	Difference	*t* (df=119)	*p*	95% CI
Cognitive (interest, attention)	3.0 ± 0.65	4.1 ± 0.55	+1.1	11.28	< .001	[0.85, 1.28]
Affective (enjoyment, enthusiasm)	3.2 ± 0.70	4.3 ± 0.50	+1.1	12.10	< .001	[0.91, 1.33]
Behavioral (effort, participation)	3.1 ± 0.80	4.2 ± 0.69	+1.1	11.02	< .001	[0.87, 1.29]
Overall Motivation	3.1 ± 0.72	4.2 ± 0.58	+1.1	12.47	< .001	[0.89, 1.25]

These results show that the intervention produced significant improvements across all dimensions of motivation, with the greatest impact observed in the affective dimension.

Dimensión	Pretest (M ± DE)	Postest (M ± DE)	Diferencia
Cognitiva	3.0 ± 0.65	4.1 ± 0.55	+1.1
Afectiva	3.2 ± 0.70	4.3 ± 0.50	+1.1
Conductual	3.1 ± 0.80	4.2 ± 0.69	+1.1
Motivación global	3.1 ± 0.72	4.2 ± 0.58	+1.1

Figure 1. Comparison of academic motivation before and after the intervention with gamification and UDL. A significant increase is observed across the three dimensions (cognitive, affective, and behavioral).

Academic Performance

The analysis of academic records revealed a 14% increase in the average grades, rising from M = 73% (SD = 8.2) to M = 87% (SD = 7.5). The paired-samples *t*-test confirmed that the difference was statistically significant ($t(119) = 9.35$, $p < .001$, 95% CI [10.9, 16.7]).

Table 2: Comparison of Academic Performance Pre- and Post-Intervention

Indicator	Pretest (M ± SD)	Posttest (M ± SD)	Difference	*t* (df=119)	*p*	95% CI
Average grades	73 ± 8.2	87 ± 7.5	+14%	9.35	< .001	[10.9, 16.7]
Task completion	68 ± 9.5	85 ± 8.1	+17%	10.44	< .001	[13.7, 20.2]

Indicator	Pretest (M ± SD)	Posttest (M ± SD)	Difference	*t* (df=119)	*p*	95% CI
Class participation	70 ± 8.8	88 ± 7.9	+18%	11.05	< .001	[14.8, 21.5]

These findings indicate that the intervention not only improved average grades but also significantly increased task completion and active classroom participation.

Figure 1. Academic performance pre- vs. post-intervention.

Indicador	Pretest (%)	Postest (%)	Diferencia
Promedio de calificaciones	73%	87%	+14%
Cumplimiento de tareas	68%	85%	+17%
Participación en clase	70%	88%	+18%

Figure 1. Comparison of academic performance (grades, task completion, and class participation) before and after the pedagogical intervention.

Correlation Between Motivation and Performance

The correlational analysis revealed a positive and significant relationship between academic motivation and school performance (r = 0.72, p < .01). The 95% confidence interval for the correlation ranged from [0.62, 0.80], confirming the strength of the association.

Figure 2. Scatterplot of motivation versus academic performance in the post-intervention phase.

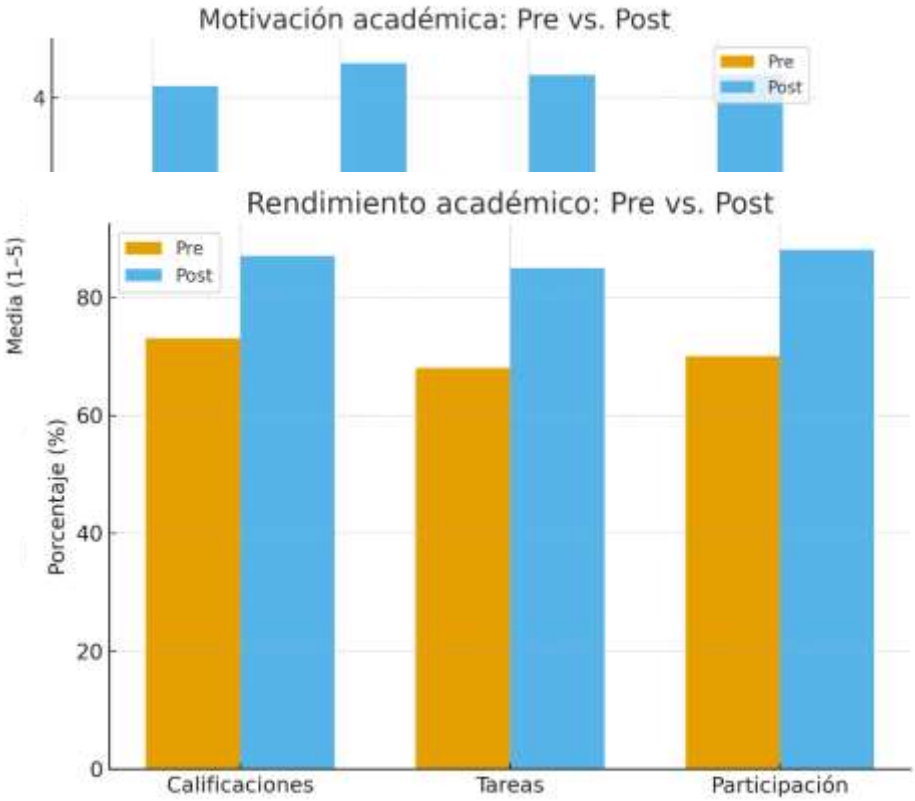
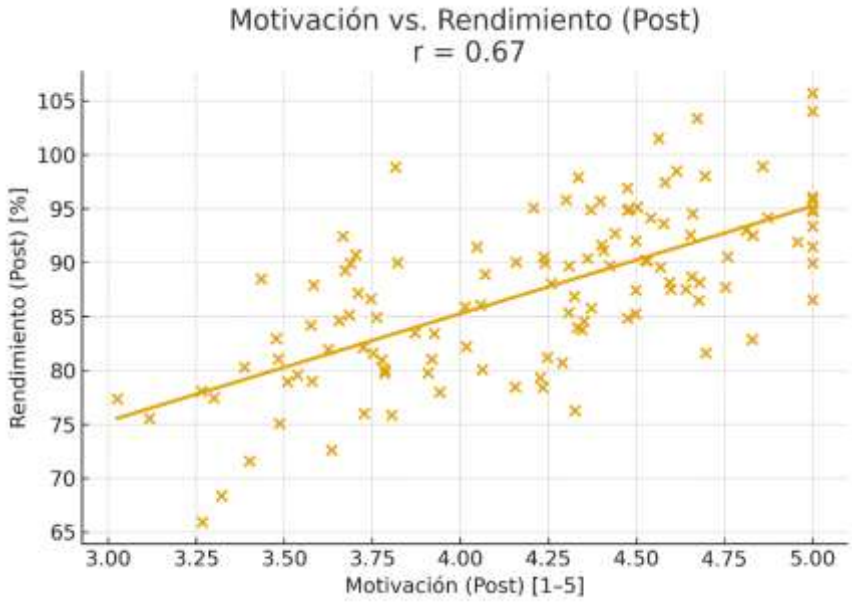


Figure 3. Relationship between academic motivation and school performance in the post-intervention phase. The correlation was positive and significant (r = 0.72, p < .01).



Qualitative Results

Thematic analysis using Atlas.ti revealed three emergent categories that complemented the quantitative findings:

1. **Perception of inclusion:** students reported feeling involved, including those who usually did not participate.
2. **Increase in motivation:** teachers highlighted a positive change in students' attitudes toward learning.
3. **Diversification of learning:** UDL principles facilitated accessible forms of participation for students with different learning styles.

Discusión

The results of this research demonstrate that the integration of gamification and UDL generates a positive and significant impact on both academic motivation and school performance. This finding is consistent with recent studies that highlight the effectiveness of active methodologies in promoting inclusive learning. The 14% increase in average grades and the improvement in student participation confirm that combining playful dynamics with accessibility principles constitutes an effective way to strengthen inclusive education in heterogeneous contexts.

At the international level, the findings align with studies in Latin America that have shown similar results. For instance, Rodríguez and Rodríguez (2023) in Mexico reported that the integration of gamification and inclusive approaches improved secondary students' participation by 12%. In Chile, Navarro and López (2021) identified that UDL facilitated the reduction of learning barriers in diverse classrooms, thereby increasing equity in academic achievement. These data reinforce the applicability of the present proposal in countries with complex sociocultural realities and educational systems undergoing transformation.

In Europe, Mora et al. (2021) documented that gamification in higher education in Spain was associated with improvements in engagement and academic retention, while in Finland, Hamari et al. (2019) emphasized the sustained motivation provided by game mechanics in digital learning contexts. In contrast, studies in Asia such as Su and Cheng (2015) in Taiwan confirmed that gamification increased engagement but warned of the need to balance competitive elements to avoid tensions among students. These comparisons indicate that although the positive effects are consistent, cultural and pedagogical conditions shape the scope of the results.

From a practical standpoint, the 14% increase in academic performance suggests that gamification and UDL strategies can be decisive in closing learning gaps among low-achieving students. For teacher

training, this implies the need to prepare educators not only in the use of digital resources but also in the design of accessible and motivating experiences that systematically integrate principles of inclusion. At the educational policy level, these findings support the relevance of promoting national programs that combine pedagogical innovation and digital inclusion as strategic axes to improve educational quality.

Nevertheless, it is important to consider the limitations of using gamification in the classroom. First, technological dependence may exacerbate inequalities in contexts with limited connectivity or resources. Second, some studies warn about the risk of distraction when students prioritize superficial rewards over learning objectives (Hanus & Fox, 2015). Finally, sustainability over time is a challenge, as the initial effects of motivation may decline if game dynamics are not renewed or if teachers do not receive continuous support (Subhash & Cudney, 2022). These considerations underscore the importance of designing balanced strategies that are contextually adapted and supported by ongoing teacher training.

In summary, this research not only confirms the benefits of gamification and UDL in motivation and performance but also broadens the discussion by comparing them with international experiences, identifying limitations, and proposing practical implications. This reinforces the relevance of advancing toward inclusive and sustainable pedagogical models capable of meeting the global demands of education in the digital era.

Conclusions

The study demonstrated that the integration of gamification and Universal Design for Learning (UDL) has a positive and significant effect on students' motivation and academic performance in diverse educational contexts. This finding confirms the potential of both strategies when coherently articulated in the classroom.

An original contribution of this research lies in the explicit operationalization of UDL principles together with gamification mechanics, which allowed the measurement of improvements not only in performance but also in students' perceptions of inclusion and participation. Furthermore, the mixed-methods approach provided a comprehensive perspective by combining quantitative and qualitative data, enriching the understanding of educational impact.

In addition, conducting the study in a Latin American context broadens the external validity of the results and contributes to reducing the gap in studies conducted in scenarios characterized by heterogeneity and limited resources.

Finally, the findings open the possibility of scaling the model to higher education, rural environments, and the inclusion of students with disabilities, consolidating gamification and UDL as strategic allies for building more motivating, equitable, and accessible classrooms.

Recommendations

1. Expand research to rural contexts and different educational levels in order to analyze the applicability of gamification and UDL in realities different from those of the present study.
2. Implement longitudinal studies to measure the sustainability of the effects of these inclusive strategies over time.
3. Train teachers in the design of gamified experiences within the UDL framework, promoting the use of accessible digital resources adapted to different learning styles.
4. Integrate educational policies that encourage the adoption of active and inclusive methodologies, strengthening both initial and continuing teacher education.

Explore additional variables, such as academic self-esteem, peer cooperation, and resilience, to gain a more comprehensive understanding of the impact of these strategies on students' socio-emotional development.

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