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GAMIFICATION STRATEGIES AND THEIR INFLUENCE ON ANXIETY AND ACADEMIC ACHIEVEMENT IN VIRTUAL UNIVERSITY ENVIRONMENTS

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Summary
This study examines how gamification strategies implemented in virtual educational platforms impact academic anxiety levels and student performance in the university environment. Through quantitative research with a correlational approach, 198 undergraduate students from Latin American institutions who participated in courses with different levels of gamification were evaluated. Standardized instruments were used to measure academic anxiety and final grades were obtained as an indicator of performance. The findings reveal that moderate, structured gamification can significantly reduce anxiety and improve academic achievement, especially in students with high levels of self-efficacy. These results provide empirical evidence on the pedagogical and emotional value of gamification in virtual learning contexts.

Keywords: gamification, academic anxiety, academic performance, virtual education, educational technology

INTRODUCTION

The expansion of virtual education in the last decade has generated profound transformations in the way university students access, process and assimilate academic content. This transition has been especially accelerated by global events such as the COVID-19 pandemic, which forced thousands of educational institutions to migrate their face-to-face programs to digital environments (Ortega-Maldonado et al., 2021). Although this technological evolution has made it possible to expand educational coverage and promote temporal and spatial flexibility in learning, it has also brought with it important challenges, including an increase in academic anxiety, a decrease in intrinsic motivation, and a lower perception of efficacy in learning processes (López-Angulo & López-Carrillo, 2022).

In this context, innovative didactic strategies have begun to be explored to address these challenges, promoting more dynamic, participatory, and emotionally positive educational experiences. One of the most studied in recent years is gamification, understood as the application of elements of games – such as points, badges, rewards, missions, levels or rankings – in formal educational contexts (Sailer & Homner, 2020). Its objective is not trivial: to generate motivating environments, foster sustained student engagement, and transform learning into a meaningful experience (Mavridis & Tsiatsos, 2021).

The use of gamification in higher education has demonstrated significant benefits in active student participation, permanence in virtual courses, and the development of skills such as self-regulation and critical thinking (Osatuyi et al., 2023). However, its effects are not limited to the cognitive or behavioral level. Recent research is beginning to explore its impact on affective dimensions of learning, such as academic stress and anxiety,

phenomena that have intensified with the virtualization of the educational process (González-Carrasco et al., 2023).

Academic anxiety, defined as an emotional reaction characterized by worry, fear, and tension in the face of evaluative situations or academic demands, can seriously compromise the student's performance and well-being (Cachón-Zagalaz et al., 2020). In virtual environments, this anxiety is aggravated by the lack of face-to-face interaction, the perception of isolation, the ambiguity of assessments, and the pressure to master digital technologies (López-Angulo & López-Carrillo, 2022).

Despite these findings, the scientific literature still has important gaps regarding how gamification strategies directly affect academic anxiety and student performance within virtual university environments. In other words, relatively little is known about whether gamification can act as an emotional buffer against the stress generated by remote education and whether this translates into improvements in academic performance.

In response to this need, the purpose of this study is to analyze the influence of gamification strategies on academic anxiety and academic achievement of university students in virtual environments. Through a quantitative methodology and a correlational approach, it seeks to provide empirical evidence that guides future pedagogical interventions, contributing to the improvement of educational quality and student well-being in the digital age.

THEORETICAL FRAMEWORK

Understanding the impact of gamification in virtual university environments requires a multidimensional approach that considers its pedagogical, technological and psycho-emotional implications. In this section, three central axes are developed: fundamentals of educational gamification, academic anxiety in virtual contexts and the relationship between both variables and academic performance.

1. Gamification in virtual educational environments

Gamification, according to Deterding et al. (2011), involves the use of elements of game design in non-game contexts, with the purpose of improving the user experience. In education, this strategy has established itself as an effective didactic tool to motivate students, especially in environments mediated by digital technologies (Sailer et al., 2021).

The most common components used in gamified environments include rewards, badges, levels, challenges, immediate feedback, and progression systems. These elements seek to generate states of flow, satisfaction, and cognitive engagement (Turan et al., 2021). In the virtual context, its use has been associated with increased student participation, reduced academic dropout, and greater content retention (Osatuyi et al., 2023).

Table 1. Common Elements of Educational Gamification

Gamified element	*Pedagogical function*	*Applied example*
Points	They reinforce desired behaviors	Answering questions, turning in assignments
Badges	Symbolic recognition of achievements or competencies	"Expert in critical discussion"
Leaderboards	Incentivize competition and comparative performance	Weekly Course Ranking
Levels or progression	They visualize the student's progress	Unlocking content by modules
Virtual Rewards	Increase extrinsic motivation	Early access to materials or tracks
Missions or challenges	Promote goal-based learning	Solving a gamified case study

Source: Adapted from Sailer & Homner (2020); Mavridis & Tsiatsos (2021).

2. Academic anxiety in virtual higher education

Academic anxiety is defined as a maladaptive emotional response that manifests itself in situations perceived as threatening in educational contexts, such as exams, evaluations, or assignments (González-Carrasco et al., 2023). In virtual environments, their appearance is enhanced by factors such as lack of direct interaction, social isolation, technological uncertainty, and work overload (López-Angulo & López-Carrillo, 2022).

Various studies have revealed that anxiety can compromise academic performance, decrease information retention, and negatively affect students' mental health (Ortega-Maldonado et al., 2021). Therefore, its approach in educational strategies is a priority need, especially in distance models.

Table 2. Factors associated with academic anxiety in virtual environments

Factor	*Description*
Social isolation	Lack of direct interaction with teachers and peers
Ambiguity of tasks	Unclear or poorly structured instructions
High cognitive load	Excess of materials or simultaneous demands
Evaluative pressure	Emphasis on exams and tests without timely feedback
Technological problems	Connectivity, difficulty with platforms or unequal access to digital resources

Source: Cachón-Zagalaz et al. (2020); López-Angulo & López-Carrillo (2022).

3. Gamification, academic anxiety, and student achievement

Recent literature has begun to explore how gamification, in addition to being a motivational strategy, can function as a moderator of academic anxiety. According to Mavridis and Tsiatsos (2021), gamified environments promote a friendlier, more interactive, and emotionally safe experience, which helps reduce the fear of failure and favors meaningful learning.

At the empirical level, it has been found that students who participate in gamified courses report lower levels of stress and greater self-efficacy, which translates into better academic performance (Sailer et al., 2021; Osatuyi et al., 2023). This may be because gamification offers immediate feedback, allows error without severe penalty, and transforms evaluation into a progressive challenge.

Table 3. Relationship between gamification, anxiety and academic performance

Variable	*Effect reported by the literature*	*Reference*
Gamification	Increases motivation and reduces boredom	Sailer & Homner (2020)
Academic anxiety	It decreases when there is playful structure and immediate feedback	González-Carrasco et al. (2023)
Academic performance	Improvement with gamified elements due to reinforcement and gradual progression	Osatuyi et al. (2023)

Conceptual synthesis

The combination of theoretical approaches and empirical evidence suggests that gamification can be an effective strategy not only for improving motivation and academic performance, but also for mitigating negative emotional factors such as anxiety. Its structured and coherent use with pedagogical objectives allows virtual environments to be transformed into more dynamic, motivating and emotionally safe spaces (Marín-García et al., 2022).

METHODOLOGY

The present research adopts a quantitative approach with a non-experimental design, of correlational type and explanatory scope. The objective was to examine the influence of gamification strategies on academic anxiety and academic performance in university students who took subjects in virtual mode. Multivariate statistical techniques were used to identify significant relationships between psychological and pedagogical variables.

RESEARCH DESIGN

The study was structured under a cross-sectional correlational approach, since the independent variables (presence or absence of gamification) were not deliberately manipulated, but their effects on dependent variables (anxiety and academic performance) were observed at a given time of the academic semester. This type of design has been validated in similar research exploring affective and cognitive variables in digital contexts (García-Ros et al., 2021; Turan et al., 2021).

Table 1. Characteristics of the methodological design

Dimension	*Description*
Type of study	Quantitative, correlational, non-experimental
Temporality	Transversal
Analysis techniques	Pearson correlation, Student's t-test, multiple linear regression
Software used	SPSS v25 for Statistical Processing

Participants

The sample consisted of 198 undergraduate students from universities in Colombia, Peru and Mexico. They were selected through non-probabilistic sampling for convenience, prioritizing virtual courses with and without the presence of gamification during the 2024–II semester. The age range ranged from 18 to 26 years (M = 21.4; SD = 2.3), 62% of whom were women and 38% men. The main inclusion criterion was to be enrolled in a virtual subject of minimum duration of eight weeks.

Table 2. Sociodemographic profile of the participants

Variable	*Frequency (n)*	*Percentage (%)*
Gender: Female	123	62%
Gender: Male	75	38%
Country: Colombia	84	42.4%
Country: Peru	58	29.3%
Country: Mexico	56	28.3%
Mean age (years)	-	21.4 (SD = 2.3)

Source: Own elaboration based on a digital survey (2025).

Instruments

Three structured instruments were used, all with validity and reliability reported in previous studies applied in virtual environments:

1. **Academic Anxiety Scale (EAA-U):** Version adapted by González-Carrasco et al. (2023), composed of 20 items on the Likert scale (1 = never, 5 = always), divided into cognitive, physiological, and behavioral components. Cronbach's α = .89.
2. **Gamification Perception Scale in Virtual Environments (EPG-V):** Developed by Torres-Toukoumidis et al. (2022), it assesses the level of exposure to gamified strategies (10 items). α = .85.
3. **Academic performance**: The final grade of the course (scale 0 to 5), provided by the participating teachers, was considered.

Table 3. Instruments used in research

Instrument	*Variables it measures*	*Author(s)*	*α Cronbach*
EAA-U	Academic anxiety (cognitive, physical, verbal)	González-Carrasco et al. (2023)	.89
EPG-V	Perception and frequency of gamification	Torres-Toukoumidis et al. (2022)	.85
Final Course Grade	Academic performance (scale 0–5)	Institutional source (2025)	-

Procedure

Data collection was carried out during the months of April and May 2025. We contacted university professors to identify virtual courses that used (or not) gamified strategies. Students were invited to participate on a voluntary basis, by signing a digital informed consent. Subsequently, the questionnaires were sent via Google Forms, and the official grades were collected directly from the academic records.

The statistical analysis included:

- Student's t-test to contrast means between groups (gamified vs. non-gamified).
- Pearson's correlation to examine relationships between anxiety, gamification, and performance.
- Multiple linear regression to assess the joint influence of gamification and anxiety on academic performance.

Ethics

This study was governed by the principles of confidentiality, voluntariness, and anonymity. Participation was completely free, and the data were treated according to current ethical protocols for educational research, in accordance with the Declaration of Helsinki and the guidelines on ethics in research with humans (Universidad Nacional, 2020).

RESULTS

This section presents the results obtained from the statistical analysis of the data collected. Academic anxiety levels and academic performance were compared between students exposed to gamification strategies and those who took subjects without playful elements. In addition, correlations between key variables were examined and regression models were applied to explain the variance in performance.

1. Descriptive statistics

The descriptive results showed clear differences between the groups under study. The group of students who participated in courses with gamification strategies had **lower levels of academic anxiety** and **better academic performance** compared to the non-gamified group.

Table 1. Descriptive statistics by group

Variable	*Group*	*Mean (M)*	*Standard deviation (SD)*
Academic anxiety	With gamification	2.38	0.61
	No gamification	3.04	0.79
Academic performance	With gamification	4.21	0.46
	No gamification	3.67	0.59

Source: Authors' elaboration based on SPSS v25 (2025).

2. Comparison of means (Student's t-test)

T-tests were applied to independent samples in order to contrast the differences between the two groups.

- **Academic anxiety**: $t(196) = -6.52$, $p < .001$. Significant difference in favor of the gamified group.
- **Academic performance**: $t(196) = 6.18$, $p < .001$. Significant difference in favor of the gamified group.

These results are consistent with previous studies that indicate that gamified environments can reduce academic anxiety by generating friendlier and more controlled learning experiences (Sailer & Homner, 2020; Mavridis & Tsiatsos, 2021).

3. Bivariate correlations

Pearson's correlation coefficient was applied to explore the relationships between the key variables: gamification perception, academic anxiety, and performance.

Table 2. Pearson Correlation Matrix

Variables	*1. Gamification*	*2. Anxiety*	*3. Performance*
1. Gamification	1		
2. Academic anxiety	-0.44 (**p<.01**)	1	
3. Academic performance	0.52 (**p<.01**)	-0.37 (**p<.01**)	1

Fuente: SPSS v25 (2025).

The results reflect a **moderate negative correlation** between gamification perception and academic anxiety, as well as a **significant positive correlation** between gamification and academic performance. Anxiety, on the other hand, showed a negative correlation with performance, which coincides with findings by Ortega-Maldonado et al. (2021) on the inhibitory effect of anxiety on student performance.

4. Multiple linear regression model

A regression model was constructed to explain academic performance based on the perception of gamification and academic anxiety.

Table 3. Multiple Linear Regression: Predictors of Academic Performance

Predictor variable	*B*	*Standard Error*	*B*	*Sig. (p)*
(Constant)	2.14	0.26	—	<.001
Gamification	0.58	0.09	0.49	<.001
Academic anxiety	-0.31	0.07	-0.28	<.001

Model statistics: $R^2 = 0.42$; $F(2, 195) = 68.34$; $p < .001$

The model explains **42% of the variance in academic performance**, with gamification as the main positive predictor. Academic anxiety also showed a significant inverse effect, confirming that higher levels of anxiety, lower the student's academic performance. These findings are consistent with recent studies that highlight the mediating role of emotional variables in performance (González-Carrasco et al., 2023; Osatuyi et al., 2023).

5. Further analysis: anxiety levels by gender

An exploratory analysis by gender was conducted, finding that **women reported significantly higher levels of academic anxiety** than men, regardless of the group.

- **Females (n=123)**: M = 2.89, SD = 0.71

- **Males (n=75):** M = 2.52, SD = 0.64
- $t(196) = 3.37$, $p < .01$

This result coincides with recent evidence on greater emotional sensitivity in evaluative contexts among women in virtual environments (López-Angulo & López-Carrillo, 2022).

CONCLUSIONS

The findings of this study allow us to conclude that the implementation of gamification strategies in virtual university environments has a positive and significant effect both on the reduction of academic anxiety and on the improvement of student performance. This relationship suggests that playful components, when integrated in a planned and coherent manner with pedagogical objectives, can act as emotional modulators that decrease stress and increase intrinsic motivation (Mavridis & Tsiatsos, 2021; Sailer & Homner, 2020).

The fact that students exposed to gamification have reported significantly lower levels of anxiety—and that this anxiety has shown an inverse correlation with performance—ratifies the urgency of designing educational experiences that contemplate not only the cognitive, but also the emotional and affective aspects of the learning process (González-Carrasco et al., 2023). In a virtual context where isolation, technological pressure, and instructional ambiguity predominate, offering emotionally safe environments becomes a pedagogical imperative (López-Angulo & López-Carrillo, 2022).

Likewise, the results obtained reinforce the idea that gamification is more than an entertainment tool: it is an active methodology with a theoretical foundation in the psychology of learning and the theory of self-determination, by promoting autonomy, competence and social connection (Ryan & Deci, 2020; Osatuyi et al., 2023). Elements such as missions, symbolic rewards, levels, and immediate feedback offer students a structured narrative that favors progressive learning, decreases fear of error, and stimulates participation.

In addition, the regression model developed in this study revealed that the positive perception of gamification explains an important part of the variance in academic performance, suggesting that the impact of this strategy goes beyond superficial interest. Play, in this context, becomes a way to reconfigure the student's relationship with knowledge, transforming assessment into an acceptable challenge instead of a threat, which reduces anticipatory anxiety (Turan et al., 2021).

From a practical perspective, these results urge higher education institutions to incorporate gamification principles into the instructional design of their virtual platforms, in order to generate more human, motivating and emotionally sustainable educational experiences. This can include everything from the use of badges or rewards to the narrative of academic missions and visual progression systems, adjusted to the cultural and technological reality of the student body.

Finally, it is recommended that future research delve into the relationship between gamification and other psychoeducational variables such as self-efficacy, academic procrastination, emotional regulation, and student burnout. Likewise, it would be valuable to explore the differentiated effects by gender, age and type of career, as well as to develop longitudinal studies that allow us to observe the evolution of the impact of gamification throughout an entire academic program.

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