GAMIFICATION TO ENHANCE UNIVERSITY STUDENTS' RESILIENCE: TRANSFORMING CHALLENGES INTO OPPORTUNITIES

GAMIFICACIÓN PARA MEJORAR LA RESILIENCIA EN ESTUDIANTES UNIVERSITARIOS: TRANSFORMANDO DESAFÍOS EN OPORTUNIDADES

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Título Abreviado:
A Gamification Proposal Enhances University Students' Resilience

How to cite this article:
Pérez-López. I. J., Navarro-Mateos, C., & Rosa, M. (2025). Gamification to Enhance University Students' Resilience: Transforming Challenges into Opportunities. *Cultura, Ciencia y Deporte*, *20*(65), 2392. https://doi.org/10.12800/ccd.v20i65.2392

Received: 05 Januari 2025 / **Accepted:** 24 April 2025

Abstract

This study investigates the impact of a gamification-based intervention on the resilience of university students, comparing it to a traditional lecture-based approach. In recent years, resilience has become a key factor in student well-being, helping them overcome academic challenges and personal difficulties. A quasi-experimental design was employed, involving 88 participants divided into an experimental group (EG) and a control group (CG). The intervention, inspired by the popular TV show *Time Zone*, integrated elements such as time management, emotional regulation, and problem-solving, all of which are essential for developing resilience. The resilience of participants was assessed using the CD-RISC 10 scale both before and after the intervention. Results revealed that the EG demonstrated significant improvements in resilience, particularly in managing adversity, achieving goals, and maintaining a positive self-concept. Conversely, the CG showed minimal changes, suggesting the impact of the gamification-based intervention. The findings highlight that students in the EG were better able to cope with stress, recover from setbacks, and achieve goals despite obstacles. This demonstrates that gamification can be an effective tool for enhancing emotional resilience and well-being, offering a compelling alternative to traditional educational methods. The results also suggest that future interventions incorporating gamification could lead to sustained improvements in student resilience. Furthermore, this study contributes to the expanding body of literature on gamification in higher education, emphasizing its potential to foster personal competencies and enhance learning outcomes.

Keywords: Gamification, resilience, university.

Resumen

Este estudio investiga el impacto de una intervención basada en la *gamificación* sobre la resiliencia de los estudiantes universitarios, comparándola con un enfoque tradicional basado en clases magistrales. En los últimos años, la resiliencia se ha convertido en un factor clave para el bienestar de los estudiantes, ayudándoles a superar desafíos académicos y dificultades personales. Se utilizó un diseño cuasi-experimental, con 88 participantes divididos en un grupo experimental (GE) y un grupo de control (GC). La intervención, inspirada en el conocido programa de televisión *Time Zone*, integró la gestión del tiempo, la regulación emocional y la resolución de problemas. La resiliencia de los participantes se evaluó utilizando la escala CD-RISC 10 antes y después de la intervención. Los resultados revelaron que el GE mostró mejoras significativas en la resiliencia, especialmente en la gestión de la adversidad, el logro de objetivos y el mantenimiento de un concepto positivo de sí mismo, mientras que el GC mostró cambios mínimos. La *gamificación* tuvo un impacto positivo en la capacidad de los estudiantes para hacer frente al estrés, recuperarse de situaciones complejas y lograr objetivos a pesar de los obstáculos. Estos hallazgos sugieren que la *gamificación* puede ser una herramienta eficaz para mejorar la resiliencia y el bienestar en la educación superior, ofreciendo una valiosa alternativa a los métodos tradicionales de enseñanza. Los resultados también sugieren que futuras intervenciones que incorporen la gamificación podrían generar mejoras sostenidas en la resiliencia del alumnado. Asimismo, este estudio contribuye a la creciente literatura sobre la *gamificación* en la educación superior, y resalta su potencial para fomentar competencias personales en los estudiantes.

Palabras clave: Gamificación, resiliencia, universidad.

Introduction

Currently, a lack of motivation and commitment among students is evident, particularly regarding active participation in their learning processes, especially in higher education (Soledispa-Rivera et al., 2020). This pressing issue highlights the urgency of implementing methodologies and strategies to counteract this trend (McCarthy & Blake, 2017; Nadelson et al., 2022).

Higher education students are increasingly diagnosed with depressive episodes, affective disorders, or anxiety disorders compared to their non-university peers (Lohner & Aprea, 2021). While mental health challenges were already prevalent among this group before the pandemic, recent evidence suggests that the pandemic has exacerbated risks to their well-being (Liu et al., 2022). Consequently, students can be considered a vulnerable population, and fostering their well-being must become a strategic priority for universities. Nevertheless, this creates a paradox, as universities are simultaneously responsible for ensuring that students acquire essential career competencies while also learning to manage the anxiety they may experience when facing certain challenges (Cao & Yu, 2023; Lohner & Aprea, 2021). In this context, the motivation to actively participate in learning is a key aspect, as it affects learning outcomes, which in turn influence anxiety and the reduction of the fear of failure (Su, 2017). Research in higher education highlights the critical role of resilience in helping students overcome obstacles, maintain well-being, and complete their academic programs successfully (Howe et al., 2012; Reyes et al., 2015). Findings suggest that resilience is strengthened through exposure to adversity, as individuals often develop greater resilience when navigating challenges (Chen & Bonanno, 2020). Although universities are increasingly addressing the importance of resilience, clear definitions and robust research on strategies to enhance resilience in students remain scarce (Brewer et al., 2019; Sanderson & Brewer, 2017). Resilience remains an emerging area of inquiry, characterized by conceptual ambiguity and a lack of methodological rigor (Beltman et al., 2011; Brewer et al., 2019).

In this context, the traditional educational paradigm, which is centered on teaching rather than learning, must give way to models that prioritize student-centered approaches, promotingmore contextualized and engaging learning experiences (Hernández et al., 2018; Liu, 2018). Active methodologies areparticularly relevant, as they seek to place students at the center of the educational process, promoting active participation, creativity, critical thinking, and reflection through approachesaimedat solving real-world problems (Peralta-Lara & Guamán-Gómez, 2020). An active learning approach can foster an attitudinal shift in students toward the learning process, increasing their motivation (Svinicki & McKeachie, 2011). In such approaches, the role of the teacher is also transformed, acting as a guide and facilitator of the process, while planning and designing meaningful experiences and activities for students (Hailikari et al., 2022; Jiménez et al., 2014). All of this seeks to help students develop autonomy, self-awareness, and take an active role in decision-making, thereby transforming their level of engagement in the educational process (Muntaner-Guasp et al., 2020).

Gamification emerges as a key tool in this context, not only because of its relevance to students but also due to its proven ability to act as a powerful catalyst for active methodologies (Navarro-Mateos & Pérez-López, 2020). Gamification is commonly defined as the application of game mechanics and dynamics in non-game contexts, enabling students to enhance their interest and engagement with the activities proposed by educators (Kapp, 2012; Zichermann & Cunningham, 2011). Aligned with this concept, movies, TV series, and television programs have emerged as influential and significant sources of entertainment for today's youth and teenagers (Medina & González, 2013; Navarro-Mateos & Pérez-López, 2022). Within the educational sphere, gamification aims to design learning experiences that are both motivating and meaningful to students by leveraging elements they find engaging. Narrative, alongside the ten foundational pillars recently proposed in the *Modelo 10-40* (Pérez-López & Navarro-Mateos, 2023), plays a critical role in this framework. These pillars include components such as a transcendental objective, missions and challenges, and meticulous attention to detail. Moreover, any gamification-based project should integrate several of the 40 proposed triggers, such as game-based learning, levels, or avatars, all designed to make the course and learning experience both compelling and engaging for students.

The objective of this article is to present a gamification proposal inspired by the television game show *Time Zone*, leveraging the cultural relevance of TV game shows among young adults. Furthermore, it seeks to analyze the impact of this approach on the resilience of university students, comparing the outcomes with those achieved through traditional teaching methodologies.

Materials and Methods

Context

The proposal was implemented in the course 'Fundamentals of Physical Education', a mandatory subject worth 6 credits. It is offered during the second semester of the second year in the Bachelor's Degree in Physical Activity and Sports Sciences at the University of Granada (Spain). The teaching period extended from February 19 to June 3, with classes scheduled on Tuesdays and Thursdays from 9:30 to 11:00, and Fridays from 12:00 to 14:00. A total of 43 sessions were conducted. This course has the following primary objectives:

- To understand how to plan physical education at the secondary education level, considering the principles of vertical and horizontal hierarchy, as well as the key elements of the curriculum.
- To develop essential skills for effective teaching, addressing the needs of both the educational context and the students.
- To internalize the significance of innovation as a means of improving educational quality.

Additionally, the competencies this course aims to develop include organizational and planning skills, problem-solving, decision-making, critical thinking, autonomous learning, flexibility, adaptability to new situations, and the fostering of creativity and teamwork skills.

Description of the Proposal

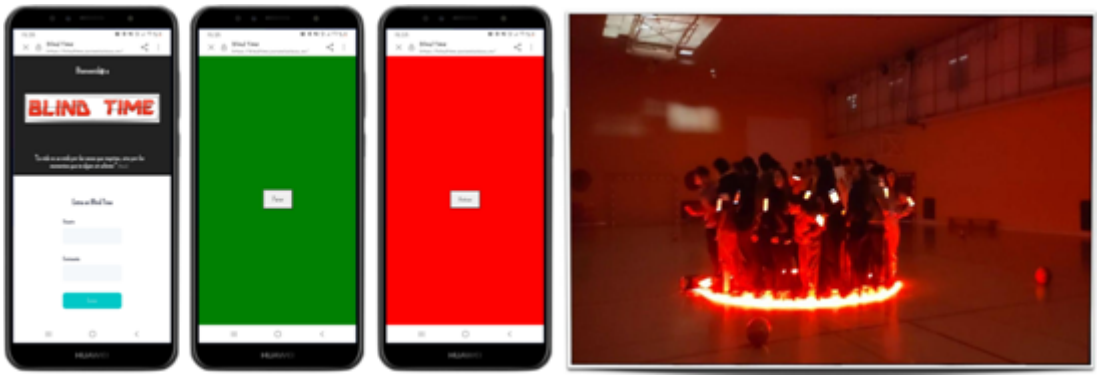
The educational experience was designed around active methodologies, specifically game-based learning and cooperative learning, further enhanced by gamification. In this context, it drew on the narrative and aesthetics of the television show *Time Zone* (premiered in July 2023 on HBO Max). In the show, contestants face a series of challenges designed to develop both physical and cognitive skills, with effective time management being crucial to avoid elimination. Additionally, participants experience a wide range of emotions that they must manage effectively —an essential skill for future educators, justifying the adaptation of the show to an educational setting.

The educational adaptation, named Blind Time, combines the essence of escape rooms with the spirit and aesthetics of video games, where time management, strategy, and alliances are key elements. In summary, it is a competition that tests emotional regulation, planning, and cooperation among participants. Although only one person can ultimately win, participants must cooperate to successfully complete each level; otherwise, the competition comes to an end. Each level, corresponding to a week, has a maximum time limit to solve three challenges, one of which is presented in each face-to-face session. Course-related content is progressively introduced through the levels. In each level, the participant with the least accumulated time loses one of their three starting lives, while the others carry over their remaining time to the final stage. The final stage, contested by participants with the highest number of lives and the most accumulated time, consists of various physical and cognitive challenges, where where the total time earned throughout the competition plays a decisive role. Therefore, time is the key to success in *Blind Time*, where contestants compete as if they were in a video game. In each episode, they earn a token, which symbolizes level completion and grants an advantage over other contestants. Collecting multiple tokens grants extra time and the opportunity to recover lost lives, further intensifying the competition.

To track and manage the time counters for all contestants, an ad hoc web application was developed (Figure 1). After registering, students could use this application to activate their timers (when the screen was red) and stop them (when the screen turned green) during each challenge. As previously mentioned, the time remained 'blind', creating aconstant sense of uncertainty about the actual time spent on the challenges. This setup fostered emotional regulation and decision-making skills. Participants had to decide whether to enter the 'time zone' (a red neon circle where time stopped—Figure 1) or stay outside, engaging in tasks that facilitated learning. Remaining outside also allowed them to locate capsules that could improve their chances of success in the program.

Figure 1

Web app and 'Time Zone' Recreated With LED Lights

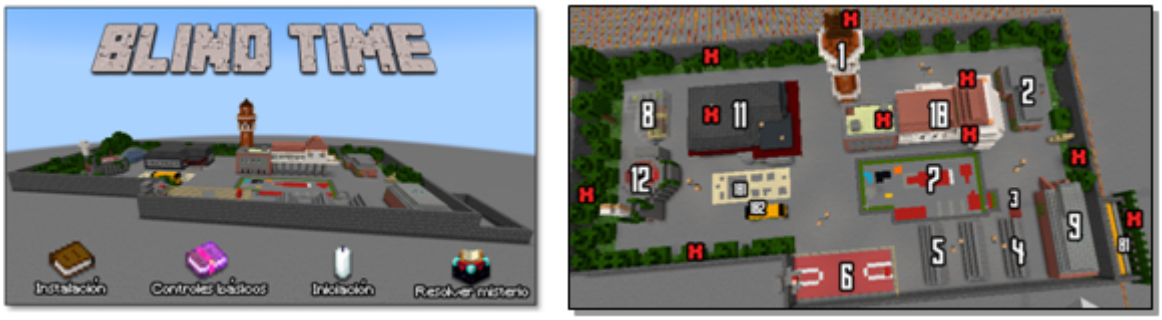


Each *program* included a variety of challenges designed to introduce students to different topics or assess their understanding of them. In some cases, students were provided with specific materials prior to the *program* day, which they needed to comprehend and assimilate to enhance their performance. In other instances, positive interdependence was fostered through small group activities. There were also occasions where assessments were conducted using applications applicable to teaching, such as *MergeCube* or *Blooket*. Additionally, physical and sports activities were combined with more cognitive elements, aiming to foster the development of diverse competencies.

One of the most engaging elements of the proposal, which maintained student interest beyond class hours, was the creation of a custom-designed video game in *Minecraft*. This game recreated the setting of the original program and incorporated tests and challenges related to the subject (Figure 2). By extending learning beyond in-person sessions, students could continue enjoying and learning through the video game. Thanks to its high relevance to the students, it generated significant motivation and enthusiasm, thus increasing their engagement with the *program*.

Figure 2

Setting and Objects of the Minecraft-Inspired Video Game



Study Design and Participants

A quasi-experimental design was employed, involving two distinct groups: an experimental group (EG) and a control group (CG). Pre-test measurements were conducted at the beginning of the course, and post-test measurements were taken at the end of the semester, following the completion of the educational intervention. The intervention for the EG was based on gamification, while the CG followed a traditional lecture-based methodology. This type of design is commonly used in studies conducted in real-world settings with natural groups, as it aims to preserve the authentic classroom environment and conditions, modified only by the intervention.

The study sample consisted of a total of 88 students, with 50 in the CG (35 males and 15 females) and 38 in the EG (25 males and 13 females). All participants were enrolled in the course 'Learning and Teaching of Physical Education' during the 2023/2024 academic year. Participants were provided with a description of the study's purpose and characteristics, and written informed consent was obtained before participation. The study protocol was approved by the Human Research Ethics Committee of the University of Granada (Approval No. 421/CEIH/2017).

Instrument

To analyze the impact of the gamification proposal, the CD-RISC 10 scale was used to assess students' perceptions. The full 25-item CD-RISC (or CD-RISC 25) has two shortened versions: the 10-item (CD-RISC 10) and the 2-item (CD-RISC 2) scales. The abbreviated version, CD-RISC 10, includes 10 items that show the highest loadings on the 'hardiness' and 'persistence' factors, with a maximum overall score of 40, where higher scores indicate greater levels of resilience (Campbell-Sills & Stein, 2007). The questionnaire is self-administered and utilizes a Likert-type scale with five response options (0 = never; 4 = almost always). The Spanish version of the 10-item CD-RISC was used in this study. Previous research has demonstrated its strong psychometric properties in young adults, making it a reliable and valid instrument for measuring resilience (Notario-Pacheco et al., 2011). The Spanish adaptation of the 10-item CD-RISC showed reliability comparable to the original version, with both versions presenting a Cronbach's α of 0.85. Factor analysis loadings ranged from 0.48 to 0.76 for the Spanish version and from 0.44 to 0.74 for the original (Notario-Pacheco et al., 2011).The items included in the questionnaire are as follows:

1. 'I am able to adapt to change'
2. 'I can deal with whatever comes my way'
3. 'I try to see the humorous side of things when I face problems'
4. 'I can handle myself well despite pressure or stress'
5. 'After a major setback, I usually 'bounce back' and recover quickly'
6. 'I believe I can achieve goals despite obstacles'
7. 'Under pressure, I stay focused and think clearly'
8. 'I am not easily discouraged by failure'
9. 'I consider myself a strong person when facing life's challenges and difficulties'
10. 'I am able to handle unpleasant and painful feelings such as sadness, fear, and anger'

Statistical Analysis

Scores on the CD-RISC 10 scale were characterized using descriptive statistical methods (mean ± standard deviation; frequencies in percentages). Specifically, the frequency differences for each question (e.g., Question 1 Control Group - % score 1 after - % score 1 before) were calculated and compared between groups (% Question 1 score 1 Control Group - % Question 1 score 1 Experimental Group). The percentage was calculated for each individual score point within each question, reflecting the proportion of participants in each group who assigned that specific score. Only differences greater than 30% between the groups were considered for analysis, focusing on comparing shifts in score attribution over time. Trends in score attribution across groups over the course of the study were described by comparing the frequency differences for each question. This analysis focused on two intervals: [interval 1] – between 30-50%; and [interval 2] – above 50%. Within-group differences before and after the intervention were calculated using non-parametric tests for repeated measures (Wilcoxon signed-rank test; $p < 0.05$). Between-group differences before and after the intervention were analyzed using non-parametric tests for independent samples (Mann-Whitney test; $p < 0.05$). Data analysis was performed using SPSS software (version 21/2024).

Results

Frequencies for Each Group

As observed in interval 2 (Table 1), questions 3, 5, 6, and 9 of the CD-RISC 10 scale showed higher differences in the distribution of scores between the groups.

In Question 3 ('I try to see the humorous side of things when I face problems'), the number of participants scoring 3 and 4 decreased in the Control Group (CG), while in the Experimental Group (EG), these scores increased, especially score 4 (42.11%).

In Question 5 ('After a major setback, I usually 'bounce back' and recover quickly'), the number of participants scoring 2 decreased in the CG, but increased in the EG. Participants selecting score 4 increased in the CG, whereas in the EG, this score decreased by 26.32%.

In Question 6 ('I believe I can achieve goals despite obstacles'), the number of participants scoring 4 increased by more than 36% in the EG, while it decreased in the CG by 20%.

In Question 9 ('I consider myself a strong person when facing life's challenges and difficulties'), the number of participants scoring 4 increased by 50% in the EG, while it slightly decreased by 8% in the CG.

Table 1

Frequencies in CD-RISC 10 for CG and EG

	Question identification score	CG (%)	EG (%)	Differences (%)
Interval 1	Q1.2	10,00	-36,84	46,84
	Q1.3	-22,00	10,53	-32,53
	Q4.2	-6	-36,84210526	30,84
	Q4.3	6	44,73684211	-38,74
	Q6.2	4	-39,47368421	43,47
	Q7.1	8	-23,68421053	31,68
	Q7.4	-4	31,57894737	-35,58
	Q8.1	-2	-34,21052632	32,21
	Q10.4	-8	31,57894737	-39,58
Interval 2	Q3.3	-64,00	10,53	-74,53
	Q3.4	-14,00	42,11	-56,11
	Q5.2	-22	36,84210526	-58,84
	Q5.4	26	-26,31578947	52,32
	Q6.4	-20	36,84210526	-56,84
	Q9.4	-8	50	-58,00

Profile of Students' Resilience During Intervention

There were differences in the pre-test scores between the groups (Table 2). Specifically, the CG had higher scores on most items, except for Question 4 ('I can handle myself well despite pressure or stress') (2.66±0.80 vs 2.45±0.83; p = 0.224), Question 7 ('Under pressure I stay focused and think clearly') (2.56±0.81 vs 2.21±0.81; p = 0.076), and Question 8 ('I am not easily discouraged by failure') (2.22±0.76 vs 2.08±0.88; p = 0.558).

The EG showed significantly higher scores at the post-test, except for Question 1 ('I am able to adapt to change'), where the difference was almost significant (Mann-Whitney test: 2.92±0.83 vs 3.26±0.50; p = 0.051).

The CG presented lower scores, but there were no significant changes after the intervention, except for Question 5 ('After a major setback, I usually 'bounce back' and recover quickly') (2.82±0.70 vs 2.60±0.57; p = 0.028) and Question 6 ('I believe I can achieve goals despite obstacles') (3.12±0.66 vs 2.84±0.58; p = 0.009), where scores decreased significantly. The EG showed significant increases in the scores of every question (p < 0.05).

Table 2

Frequencies in CD-RISC 10 for CG and EG

	CG (n=50)			EG (n=38)			P-value				
	Pre-test	Post-test	Mean diff	Pre-test	Post-test	Mean diff	CG pre-test EG pre-test	CG post-test EG post-test	CG pre-test CG post-test	EG pre-test EG post-test	CG mean diff EG mean diff
Q1	3.02±0.59	2.92±0.83	-0.10±0.68	2.55±0.56	3.26±0.50	0.71±0.69	0.000*	0.051	0.297	0.000*	0.000*
Q2	2.84±0.62	2.72±0.61	-0.12±0.63	2.47±0.65	3.30±0.46	0.82±0.69	0.012*	0.000*	0.180	0.000*	0.000*
Q3	2.92±0.60	2.80±0.61	-0.12±0.56	2.37±0.75	3.44±0.50	1.08±0.67	0.001*	0.000*	0.134	0.000*	0.000*
Q4	2.66±0.80	2.60±0.81	-0.06±0.77	2.45±0.83	3.13±0.34	0.68±0.90	0.224	0.000*	0.572	0.000*	0.000*
Q5	2.82±0.70	2.60±0.57	-0.22±0.68	2.34±0.78	3.24±0.49	0.89±0.83	0.009*	0.000*	0.028*	0.000*	0.000*
Q6	3.12±0.66	2.84±0.58	-0.28±0.70	2.61±0.50	3.37±0.49	0.76±0.63	0.000*	0.000*	0.009*	0.000*	0.000*
Q7	2.56±0.81	2.40±0.86	-0.16±0.98	2.21±0.81	3.32±0.47	1.11±0.92	0.076	0.000*	0.293	0.000*	0.000*
Q8	2.22±0.76	2.32±0.71	0.10±0.93	2.08±0.88	3.21±0.47	1.13±0.84	0.558	0.000*	0.370	0.000*	0.000*
Q9	2.88±0.75	2.80±0.70	-0.29±0.75	2.50±0.80	3.53±0.56	1.03±0.99	0.021*	0.000*	0.448	0.000*	0.000*
Q10	2.62±0.75	2.52±0.71	-0.10±0.71	2.18±0.73	3.32±0.47	1.13±0.81	0.013*	0.000*	0.317	0.000*	0.000*
Total	27.66±4.34	26.52±4.88	-1.14±4.49	23.76±4.92	33.10±2.41	9.34±4.83	0.001*	0.000*	0.160	0.000*	0.000*

Q1. 'I am able to adapt to change'; Q2. 'I can deal with whatever comes my way'; Q3. 'I try to see the humorous side of things when I face problems'; Q4.'I can handle myself well despite pressure or stress'; Q5. 'After a major setback, I usually 'bounce back' and recover quickly'; Q6. 'I believe I can achieve goals despite obstacles'; Q7. 'Under pressure, I stay focused and think clearly'; Q8. 'I am not easily discouraged by failure'; Q9.'I consider myself a strong person when facing life's challenges and difficulties'; Q10. 'I am able to handle unpleasant and painful feelings such as sadness, fear, and anger'

Discussion

The main aim of this study was to analyze the impact of a gamification proposal on levels of resilience, compared to a control group using a traditional lecture-based methodology. The findings reveal the positive impact of the gamification experience based on a TV show during the students' academic development. This variable is highly relevant in today's society, as it is considered one of the factors that most contributes to students' well-being (Archana & Singh, 2014).

Regarding the instrument used, other interventions conducted in a university context suggest that the CD-RISC scale assesses more stable traits rather than specific skills (Akeman et al., 2020). In this regard, the use of additional measures should be considered to assess the modifiability of resilience factors (Cassidy, 2016; Julian et al., 2020). Specifically, for the short version of the instrument, item response theory (IRT) analysis revealed that both individual items and the overall scale reliably measure resilience (Minh-Uyen & Im, 2021). As confirmed by Notario-Pacheco et al. (2011), the Spanish version of the 10-item CD-RISC showed good psychometric properties in young adults and can thus be used as a valid and consistent instrument for measuring resilience in the university context. In the field of education, particularly in gamification proposals, it would be interesting to complement this quantitative information with a qualitative approach to truly understand the complexity of reality and delve deeper into the feelings, learning, and emotions generated by such approaches. As seen in other gamification proposals carried out in teacher training, qualitative research highlights the emphasis students place on curiosity and expectation in learning (Navarro-Mateos & Pérez-López, 2024), as well as the challenges (which motivated them to perform at their best), the feedback (which facilitated their learning and sense of progress), and the attention to detail (which improved immersion and the proposal's credibility) (Navarro-Mateos et al., 2024a).

Educational interventions that focus on resilience help students overcome academic challenges and the obstacles of their daily lives (Lohner & Aprea, 2021). Previous studies have shown that proper interventions can increase resilience and well-being in higher education students, reducing their stress and anxiety levels while improving academic performance (Akeman et al., 2020; Hill et al., 2018; Van Breda, 2018). In the context of gamification, other educational interventions implemented in a university setting have demonstrated their impact on key variables such as classroom climate, emotional management, body composition, and the improvement of healthy lifestyle habits (Mora-González et al., 2020; Pérez-López et al., 2017; Pérez-López et al., 2019), highlighting the potential of gamification in higher education. When analyzing the scientific literature, we find that proposals aimed at strengthening university students' resilience through gamificationfocus on the use of mobile applications (Litvin et al., 2023; Nicolaidou et al., 2021). These approaches often emphasize the use of

PBL (Points, Badges, and Leaderboards), which primarily affects participants' extrinsic motivation. In fact, in the intervention carried out by Nicolaidou et al. (2021), students positively valued elements such as points, but they highlighted other aspects such as goal setting and collaboration, suggesting that in the education, it is essential to go beyond extrinsic factors to truly generate formative and personal impact. There are few university-level interventions that truly incorporate an immersive narrative and focus on intrinsic motivation, making comparisons with other proposals difficult. The only identified example is the proposal by Navarro-Mateos et al. (2024b), which incorporated a mobile app to manage a proposal based on the *Star Wars* saga. In this case, the gamification-based group showed a significantly higher improvement in emotional intelligence ($P \leq 0.006$), personal initiative ($P \leq 0.033$), entrepreneurial attitude ($P < 0.001$), resilience ($P = 0.002$), and self-efficacy ($P < 0.001$), compared to the control group (traditional lecture-based methodology), with results aligning with those obtained in the *Blind Time* proposal.

Regarding the results, overall, the gamification intervention had a greater impact on resilience competencies, as measured by the CD-RISC 10. The only exception was Question 1 ('I am able to adapt to change'). Adapting to change may be a skill that requires more time or sustained effort for its effects to be properly assessed. A conventional pedagogical strategy may not be the most effective for fostering resilience skills in students (Chow et al., 2020), as it runs the risk of negatively affecting certain aspects of coping strategy development in difficult contexts, as observed in Questions 5 ('After a major setback, I usually 'bounce back' and recover quickly') and Question 6 ('I believe I can achieve goals despite obstacles').

A difference in the distribution of scores was detected between the groups, with a positive trend for the experimental group in the following questions: (3)'I try to see the humorous side of things when I face problems', (5)'After a major setback, I usually 'bounce back'and recover quickly', (6)'I believe I can achieve goals despite obstacles', and (9)'I consider myself a strong person when facing life's challenges and difficulties'. These results highlight how individuals can manage coping strategies after an intervention based on gamification, particularly in terms of humor, goal management, and a positive self-conception. For example, the experimental group showed a more favorable response to questions like 'I try to see the humorous side of things when I face problems and 'After a major setback, I usually 'bounce back' and recover quickly'. This aligns with findings from studies that demonstrate the impact of gamification on resilience and stress management. For instance, study by Navarro-Mateos et al. (2024b) found that gamification in educational settings can promote positive psychological outcomes, including greater resilience and the ability to cope with adversity, by encouraging active engagement and providing immediate feedback.

Moreover, participants in the experimental group reported more confidence in achieving goals despite obstacles, as seen in responses to the question, 'I believe I can achieve goals despite obstacles'. This aligns with the work of Banfield & Wikerson (2014), who observed that gamified learning environments can strengthen students' self-efficacy and belief in their abilities, particularly through the sense of accomplishment and progression that gamification facilitates (Pérez-López & Navarro-Mateos, 2023).

Furthermore, the experimental group's positive shift in self-conception, as indicated by responses like 'I consider myself a strong person when facing life's challenges and difficulties', highlights how gam ification may influence students' self-esteem and self-efficacy. Studies by Deterding et al. (2011) and Hamari et al. (2014) have shown that gamification, by incorporating elements like rewards, challenges, and feedback loops, can positively impact students' perceptions of their own capabilities, which, in turn, enhances their ability to manage stress and overcome challenges.

Limitations and Future Studies

This study has several limitations, including differences in pre-test scores between the groups, which indicate a lack of homogeneity in resilience competencies. Future research should adopt experimental designs, include follow-up assessments, and explore the long-term benefits of such interventions. Additionally, the validity of the instrument used should be further examined. Incorporating mixed methods, such as qualitative analysis, could provide deeper insights into the outcomes of the intervention.

Conclusion

This study demonstrates the positive impact of gamification on the development of resilience in university students, highlighting its potential to foster emotional regulation, goal-setting, and coping strategies. The experimental group showed significant improvements in resilience competencies, particularly in achieving goals despite obstacles and adversity, and

in managing pressure and stress. These findings suggest that gamification is not only an effective tool for increasing engagement and motivation in students but also a promising approach to enhancing their psychological well-being and personal development. The ability to manage stress, adapt to challenges, and maintain a positive outlook despite setbacks are critical skills for success in both academic and personal life. The positive effects observed in this study reinforce the potential for gamification to transform traditional educational methodologies and provide students with practical tools for navigating life's challenges.

Ethics Committee Statement

The Ethics Committee of the University of Granada approved the study protocol (No. 421/CEIH/2017).

Conflict of Interest Statement

The authors declare no conflicts of interest.

Funding

This research did not receive any funding.

Authors' Contribution

Introduction and Conceptualization: Carmen Navarro-Mateos & Isaac J. Pérez-López; Project Design: Isaac J. Pérez-López; Formal Analysis and Data Curation: Marlene Rosa; Writing – Original Draft: Carmen Navarro-Mateos; Writing – Review & Editing: Marlene Rosa; Supervision: Isaac J. Pérez-López.

All authors have read and agreed to the published version of the manuscript.

Data Availability Statement

The authors have access to the database used in the article.

Acknowledgements

The authors do not wish to include acknowledgments.

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