DIGITALEDUCATIONREVIEW

Gamification and Technological Resources: Innovative Experiences to Motivate and Optimize the Learning Process in University Contexts

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ABSTRACT

The use of gamified technological tools represents an alternative pedagogical practice to enhance the teaching-learning process in higher education. Teachers should employ innovative strategies that foster active, meaningful, and interactive learning in the classroom. This research aims to determine whether the implementation of digital resources based on gamification—Genially, Nearpod, Educaplay, and Quizizz—improves students' evaluation of learning (in terms of knowledge acquisition, teacher training, and motivation) in both face-to-face and online courses across various social science disciplines in higher education. A pre-experimental design was used with pre- and post-intervention measurements conducted over four months (n=345). The results reveal significant improvements in students' perceptions of teaching style, methodological innovation, content comprehension, problem solving, motivation, participation, and collaborative work. In addition, higher levels of digital competence, self-assessment, and adaptability to new digital resources were observed. Taken together, these findings confirm that gamification supports active, meaningful, and autonomous learning, consolidating its role as an effective strategy in higher education.

1 INTRODUCTION

The challenges of the information and knowledge age demand the acquisition of new competencies for active citizenship and personal, social, academic, and professional development. Education systems should respond to these new training requirements (Inamorato dos Santos et al., 2023). The integration of Learning and Knowledge Technologies (LKT) and Empowerment and Participation Technologies (EPT) into classrooms is becoming a reality with the increased availability of computer equipment and Internet connectivity. This shift challenges the foundations of traditional teaching based on memorization, paving the way for more innovative approaches that meet the demands of contemporary society and the acquisition of 21st-century skills (Muammar et al., 2023).

However, the inclusion of ICT (Information and Communication Technologies), LKT and EPT tools in the classroom necessitates teacher training and the acquisition of new skills and teaching strategies required for the knowledge society (Siddiq et al., 2023). Digital literacy has become an essential competence, fundamental alongside literacy and basic mathematical operations (Garzón et al., 2020). Teachers should possess the necessary digital skills to plan, implement, and evaluate digital literacy, develop methodological proposals, and select appropriate materials to improve learning outcomes (Heine et al., 2023). The teaching-learning processes implemented to meet today's societal demands are based on the use of ICT, LKT, and EPT in the classroom, employing more dynamic and motivating methods.

Educational innovation should drive change and improvement in the educational structure (Deroncele et al., 2023). Thus, this proposal on teaching innovation emphasizes the inclusion of knowledge construction and dissemination strategies observed in today's society, particularly those based on digital gamified platforms prevalent among digital natives, which could become valuable allies in education (Torrado-Crespón & Díaz Lage, 2022). Within this conceptual framework, we propose an innovative and active teaching approach that prioritizes cooperative learning, involving heterogeneous student groups working to solve tasks and develop learning. Gamification, the integration of game dynamics in non-game contexts (Lee & Hammer, 2011), enables students to learn more actively and creatively, better retaining what they have learned and enhancing interest and motivation in various social sciences disciplines in both face-to-face and online contexts.

Gamification, as employed in this study, is an innovative methodology offering both students and teachers a practical learning experience aimed at digital literacy (Torrado Cespón & Bárcena Toyos, 2025; de Carvalho & Coelho, 2022). This research presents a novel pedagogical experience in higher education by implementing the ICT-LKT-EPT spiral model of competence development and the gamified resources Genially, Quizizz, Nearpod, and Educaplay (Di Michele et al., 2023). The findings suggest these applications can significantly benefit the educational sector, fostering the methodological renewal required by college students.

2 LITERATURE REVIEW

2.1 Importance of digital literacy in teaching for the improvement of learning

To meet the educational demands of the 21st century, it is essential to adapt teaching, learning, and assessment methods and to incorporate new materials, procedures, skills, abilities, and competencies into the teaching-learning processes. One prominent reference model is the TPACK model (Handayani et al., 2023), which posits that teachers should effectively integrate disciplinary, pedagogical and technological knowledge. This tripartite interaction is crucial for competent teaching, and thus, training students within this framework is imperative (Jiménez et al., 2023).

Teachers play a pivotal role in this pedagogical transformation supported by technology, combining the use of ICT with new teaching-learning methods to enhance students' competence levels, enabling them to construct, communicate, collaborate, and share knowledge (Ng et al., 2023). Digital literacy encompasses the knowledge, skills, and attitudes necessary to navigate today's digital environment. It is a critical and transversal competence, supporting the attainment of other competencies such as linguistic or mathematical literacy (Ferrari, 2012). Therefore, there should be a pedagogical integration of ICT in the classroom to ensure that it leads to pedagogical changes and innovations that improve teaching and learning processes (Marnita et al., 2023).

Three fundamental milestones in establishing the concept of teaching digital competence and its definitions and indicators are the UNESCO report (2008), the DIGCOMP report (Punie et al., 2013), and DigCompEdu (Punie & Redecker, 2017). From an institutional perspective, the European Commission's DIGCOMP framework (2013) provided a common reference for describing digital competence in terms of knowledge, skills, and attitudes. More recently, DigComp 2.2 has updated and expanded this model, offering more than 250 new examples of digital competences, including references to emerging technologies such as artificial intelligence, and consolidating DigComp as a key reference for digital skills policy, curriculum design and assessment across Europe (Vuorikari et al., 2022). In addition, the Joint Research Centre is currently working on DigComp 3.0, an updated version expected to be published in 2025, which will refine competence descriptors, systematically integrate AI-related competences and introduce learning outcomes linked to proficiency levels. Additionally, the Spanish Framework for the Digital Competence of Teachers (2022) aims to define digital teaching competencies to guide teacher training and ensure "high-quality teaching" (Palacios-Rodríguez & Martín-Párraga, 2021).

Developing digital competences should be a priority for preparing teachers to guide 21st-century students through new technological media. The new teaching strategies in the European Higher Education Area (EHEA) call for structural changes in conceptualizing the teaching-learning process in higher education, justifying the inclusion of ICT in teacher training to enhance student learning (Leal Filho et al., 2024). Teachers will face various tasks related to planning, intervention, communication, and updating in their professional practice. Digital competence is crucial in the college environment, as it is essential for meeting the emerging knowledge challenges of the information society. Consequently, teachers, regardless of their subject area, should contribute to students' digital literacy acquisition (Kamsker et al., 2020).

2.2. Development of ICT-LKT-EPT competencies in higher education

New technologies have become common tools not only in various disciplines and fields. In education, technological progress has enabled the integration of new resources to improve the teaching and learning process, making it more

efficient and effective. The use of ICT, LKT, and EPT opens a new paradigm that affects pedagogical methodologies in the teaching-learning process. Their use is essential for students to achieve educational objectives and acquire meaningful learning, as they provide a wealth of resources and didactic possibilities (Gashoot et al., 2023).

The incorporation of digital technology into the educational process requires teachers to acquire new skills as planners and guides in the exploration and construction of knowledge. ICT, LKT, and EPT are key terms used to describe the various resources and technologies that are transforming learning in the classroom (Sánchez et al., 2021). ICT encompasses all technological tools used to process, store, and transmit information. LKT refers to tools and technologies used specifically for teaching and learning. EPT includes tools and technologies that promote students' active participation and empowerment in the educational process. The ICT-LKT-EPT spiral model of competence development suggests that teachers, starting from constructivist training processes in educational technology, can use ICT to acquire LKT and finally EPT (Alnasib, 2023).

Our research aims to implement these concepts in practice, considering ICT, LKT, and EPT as key tools in contemporary education. These technologies offer numerous resources to improve education quality, promote active student participation, and develop digital skills and competencies relevant to today's labor market (Van Laar et al., 2020). Various studies show that using these tools can improve access to information, foster collaboration, personalize learning, promote creativity, enhance academic performance, and active student participation (Angelova, 2024; Maspul, 2024). ICT, LKT, and EPT are effective means of improving education quality and preparing students for future challenges (Anaktototy, 2023).

2.3. Digital gamification in university teaching: from theory to practice

To achieve this, our research intends to merge the ICT-LKT-EPT spiral model of competence development with gamification, where students are protagonists of their own learning. Gamification in higher education is grounded in several complementary psychological and learning theories that help explain how and why gamified instruction can influence students' perceptions of knowledge acquisition, teacher training and motivation. Self-Determination Theory (SDT) is particularly prominent, as it posits that learners' intrinsic motivation increases when the basic psychological needs for autonomy, competence and relatedness are satisfied (Ryan & Deci, 2000). Well-designed gamified activities can support these needs by offering meaningful choices (autonomy), optimally challenging tasks with clear feedback (competence), and opportunities for collaboration and social connection (relatedness), although imbalances among these needs may undermine motivation (Gao, 2024). Goal-Setting Theory further suggests that specific, challenging goals, coupled with commitment and self-efficacy, direct attention, mobilize effort and sustain persistence (Locke & Latham, 2002); in gamified environments, these goals are operationalized through levels, missions and challenges. Flow Theory adds that learning is optimized when there is a balance between task difficulty and learner skills, producing a state of deep concentration and enjoyment characterized by clear goals and immediate feedback (Csíkszentmihályi, 1990). Building on these perspectives, intrinsic motivation approaches argue that long-term engagement is best supported when students participate in activities for interest and personal meaning rather than for external rewards alone (Pink, 2011). Translating these theoretical principles into practice requires structured design frameworks that align game elements with pedagogical objectives and student characteristics. Models such as Werbach and Hunter's (2012) pyramid of game elements distinguish between components (e.g., points, badges, avatars), mechanics (e.g., collaboration, rewards, feedback) and dynamics (e.g., narrative, emotion), emphasizing that effective gamification depends on how these layers interact to foster desired behaviors rather than on the mere addition of superficial features. In this study, we focus on four widely used platforms—Genially, Nearpod, Educaplay, and Quizizz—and their potential for embedding features such as points, rewards, badges, and leaderboards, which provide students with clear goals and immediate feedback. Game mechanics, including classroom competitions, time-limited challenges, and progressive levels of difficulty, help structure the flow of activities and sustain engagement over time. These mechanics give rise to dynamics, that is, patterns of interaction among students and between students and the platform such as collaboration, rivalry, persistence, and strategic decision-making. These tools exemplify a balanced integration of these components, offering competitive quizzes, real-time feedback, and rankings that incentivize active participation and achievement (Feijoó et al., 2024).

Although framed today as an innovative methodology, gamification builds on principles that have long been present in formal education. As Lee and Hammer (2011) note, traditional schooling already relies on game-like structures, whereby students are rewarded with points or higher grades for appropriate performance and behavior and penalized with lower grades for undesirable actions, progressing to the next level (academic year) only when specified objectives are met. Contemporary digital gamification makes these mechanisms more explicit, interactive, and student-friendly. It is now widely regarded as a powerful strategy for enhancing the learning experience by increasing motivation and engagement, improving knowledge retention, and supporting foreign language learning (Jaramillo-Mediavilla et al., 2024). Furthermore, gamification allows university students to perceive learning as enjoyable and meaningful (Tews et al., 2017), benefiting from their familiarity with gaming and human beings' natural curiosity. In addition, gamified activities have been shown to foster the development of key transversal skills, including problem-solving, critical thinking, and collaborative work (Bourke, 2021), which are essential for success in current and future academic and professional contexts.

Feedback from gamification provides immediate progress updates. Authors such as Alomari et al. (2019), Saleem et al. (2022) and Climent (2025) consider gamification an effective strategy for optimizing learning objectives and improving performance. Gamification positively impacts students' cognitive and emotional levels by changing their engagement in the classroom (Majdoub & Heilporn, 2024) and optimizing learning objectives and performance (Maraza-Quispe et al., 2024). Gamification allows students to reinvent, repeat, observe, and innovate to learn (Nadeem et al., 2023). This paper aims to provide teachers with digital gamified tools to make lessons more enjoyable, increase student interest in learning, and motivate class participation. Our research presents a novel educational experience in higher education by implementing the ICT-LKT-EPT spiral model of competence development through gamified didactic resources such as Genially, Nearpod, Educaplay, and Quizizz. Recent research shows that these gamified digital tools promote technological literacy, facilitate motivation, and increase student engagement and involvement in the learning process. The combination of these tools with creative activity design improves student performance.

Our research question is: Can the use of gamified digital resources improve students' perception in terms of knowledge acquisition, teacher training, and student motivation in various subjects and both online and face-to-face university contexts? Our primary contribution is to analyze whether digital gamification enhances student learning (in terms of knowledge acquisition, teacher training, and motivation) in both online and face-to-face university contexts (Di Michele et al., 2023). The underlying aim is to contribute to the enhancement of current higher education practices by examining how specific gamified tools can support high-quality, student-centered instruction. By integrating digital gamified platforms, we seek to promote training that is better aligned with contemporary educational demands and to encourage lecturers to design more engaging, creative, and strategically structured activities that foster students' interest and academic performance.

3 METHODOLOGY

The design is pre-experimental with pre- and post-test measurements, following Maciejewski's approach (2018). This design involves only one group of students as the experimental group. In September, students provided consent and completed an initial questionnaire (PRE). The didactic experience was conducted from September to December. In January, the same final questionnaire (POST) was administered to evaluate learning outcomes in terms of knowledge acquisition, teacher training, and motivation. Additionally, seven questions were included for the final evaluation of digital resource use in the classroom.

3.1. Sample

The number of participants was 345. Initially, 376 students responded to the PRE-questionnaire, but only 345 responded to the POST-questionnaire, resulting in a sample mortality of 31 students. The final sample comprised 37% males and 63% females, with 72% undergraduate students and 28% master's degree students. Half of the participants were enrolled in face-to-face college programs, and the other half were in online programs. Regarding age distribution, 48% were

between 18 and 28, 24% were between 29 and 38, and 28% were 39 or older. Participants were selected using a non-probabilistic intentional sampling method. The experiment took place during the first semester of the academic year 2024-2025.

All students took part in the experiment; that is, they completed the pre-intervention questionnaire, participated in the didactic experience, and completed the post-intervention questionnaire.

With regard to the digital tools employed, the universities that participated in this study do not offer specific courses or seminars on this topic. Consequently, the intervention built on the prior knowledge that each student could contribute, although none had previously used these resources in the context of their classes. One of the professors conducting this study possessed formal training in gamification and instructional design and the other lecturers expressed strong interest in it, always implementing active methodologies, and among them, gamification, and using digital tools. This disposition is essential for the development of teaching proposals aligned with the ICT-LKT-EPT competency-based model from a constructivist perspective.

The degrees involved, all belonging to Social Sciences disciplines (Teacher Training, Tourism and Commerce) are clearly related to areas where gamification is highly relevant: in education, it is widely used with pedagogical aims to enhance student motivation and learning, no matter the students' age, and in tourism it is widely applied for marketing, customer engagement and business purposes. Therefore, we consider students should be familiarized with its dynamics, mechanics and components in order to develop their future academic endeavors successfully. The incorporation of gamified resources was also appropriate for reinforcing conceptual understanding, problem-solving, and academic motivation. This gamification proposal was implemented in English, as it can be observed in Figures 1, 2, 3, and 4 in all the subjects: Music Education, English for Tourism, and English for Commerce. Despite the vehicular language used is not students' mother tongue, the results were very positive, and it was not a determining factor. However, the questionnaires were administered in Spanish to avoid potential misunderstandings or errors arising from language comprehension issues.

3.2. Ethics

The research design and questionnaire were submitted to and approved by the Ethics Committee of the Universidad del Atlántico Norte (Spain) under the code CEI/01-012. Participation in the study was anonymous and voluntary. All participants were adequately informed of the research, were provided informed consent before completing the questionnaire and were free to withdraw or not submit their responses at any time, following the ethical guidelines described in the Declaration of Helsinki (2013).

3.3. Research Design

The didactic proposal implemented aims to improve student learning by offering more attractive and engaging activities that facilitate meaningful learning in a stress-free environment, promoting reflection, discovery, problem-solving, and analysis. Four digital platforms were used to revise previously learned content, introduce new concepts, or as warm-up exercises to engage students. The tools used were Genially, Nearpod, Educaplay, and Quizizz. Students received rewards based on their performance, which contributed to their final assessment, thereby increasing motivation and participation. The resources were used synchronously and individually in class, with students and teachers discussing questions and revising difficult content afterward. Throughout the development of the project, teachers played a key and active role in the design, planning, and implementing the gamified activities, which were tailored to the diverse learning programs and styles of their students. They already possessed well-established competencies in active methodologies, gamification, and the use of digital tools, which enabled them to autonomously and effectively apply the ICT-LKT-TEP spiral competency model from a constructivist perspective, integrating digital strategies that promote active participation, collaborative work, and meaningful learning. To support the use of these tools, accessible and well-structured resources

with clear instructions were provided, allowing teachers to select and adapt activities to meet the specific needs of their students.

Following the implementation of gamified activities, structured discussion spaces were systematically organized between teachers and students at the end of each session. These discussions were conducted synchronously and in real time and followed a structured format that included a joint review of student performance, analysis of the most challenging questions, and reflection on the strategies employed. The primary aim of these interactions was to reinforce meaningful learning, enhance content comprehension, stimulate critical thinking, and foster a participatory and collaborative environment focused on the continuous improvement of the educational process. These dynamics were facilitated through teacher-led questions that encouraged active student involvement in co-evaluation and meta-analysis of both individual and group performance. During these sessions, a bidirectional exchange of feedback occurred. Students shared their views on the usefulness, clarity, and motivational impact of the digital tools used, as well as suggestions for improving their integration.

Genially allows for the creation of visual and interactive content, drawing students' attention through customizable visual designs (Tapia-Machuca et al., 2020). It stimulates users' interest through exploration and discovery using creative and dynamic elements, making content easier to remember (Domínguez-Parrales, 2024). Genially stands out for its ability to transform content into visual and interactive experiences, making it possible to create customized materials that capture students' attention through dynamic and creative designs that encourage exploration and understanding of the content. Likewise, this tool makes it possible to build gamified pathways that foster critical thinking, exploration, and active student participation, as highlighted by recent research on the use of interactive digital environments in higher education (Moreno-Rodríguez et al., 2023; Martín-Caraballo et al., 2024).

Figure 1 is an example of a Genially activity:

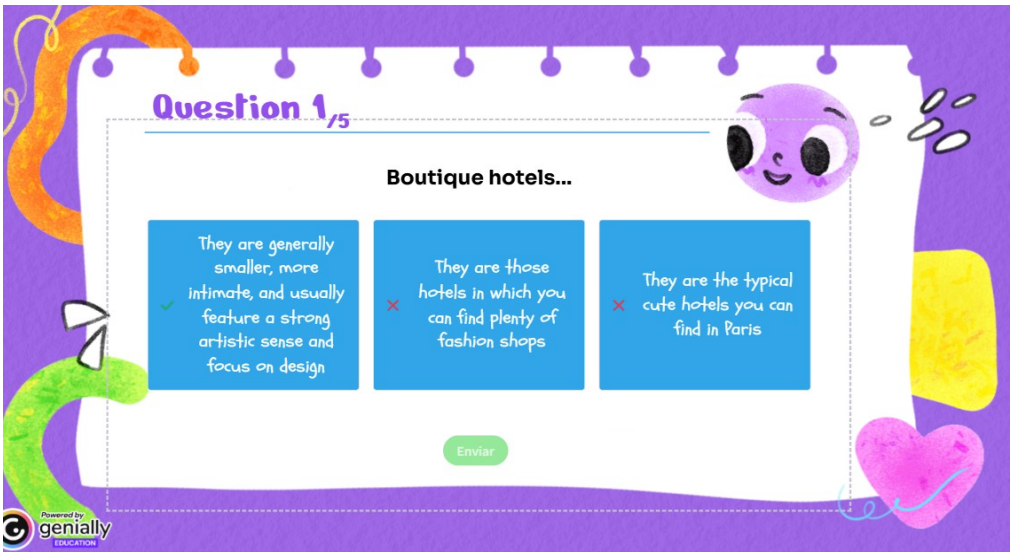

Figure 1. Quiz True or false. https://view.genially.com/652811e77edd5800110290c0/interactive-content-quiz-true-or-false-accommodation

Nearpod is an interactive learning platform that offers polls, quizzes, interactive videos, and collaboration tasks (Sarginson & McPherson, 2021), facilitating engagement and motivation (Hakami, 2020). It can be used synchronously or asynchronously and provides a suitable framework for transitioning from lecture mode to individual or group activities (Pérez, 2017). It generates reports on student participation and performance, supporting active learning (Burton, 2019). Nearpod is a platform that integrates presentations, quizzes, collaborative activities and multimedia resources in a single environment, as well as continuous monitoring of the learning process. Its structure allows the lecturer to guide students through interactive activities that reinforce understanding and formative feedback. It contributes directly to student engagement and motivation (Hakami, 2020). Moreover, its ability to generate real-time performance reports (Burton, 2019) enhances immediate feedback, promoting reflection and ongoing monitoring of learning.

In Figure 2, we can observe a Nearpod activity:

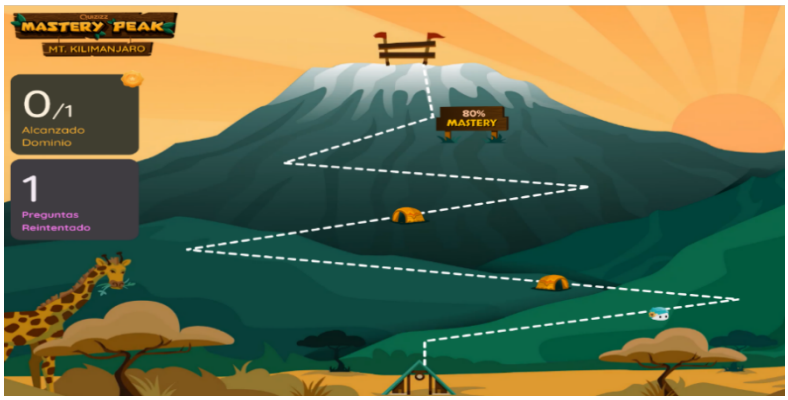

Figure 2. Nearpood. International commerce vocabulary. https://app.nearpod.com/?pin=8FC11B64534F81A1A9499B5DAE3CF681-1&&utm_source=link

Educaplay is a multimedia tool that allows teachers to design, develop, implement, and register online teaching activities based on gamification principles, such as crossword puzzles, word searches, interactive maps, dictations, quizzes, and more. It is accessible and integrates well with institutional Learning Managemet Systems (e.g., Moodle), making it suitable for higher education (García-Martín & García-Martín, 2020). Its immediate feedback and scoring systems promote dynamic, participatory learning, with positive effects on motivation and academic performance, as reported in several recent studies (Ayuningrum, 2024; Páez-Quinde et al., 2022). Moreover, the study highlights its accessibility and its integration with institutional platforms such as Moodle, which makes it an optimal tool for higher education (García-Martín & García-Martín, 2020). Below, we can appreciate an Educaplay activity:

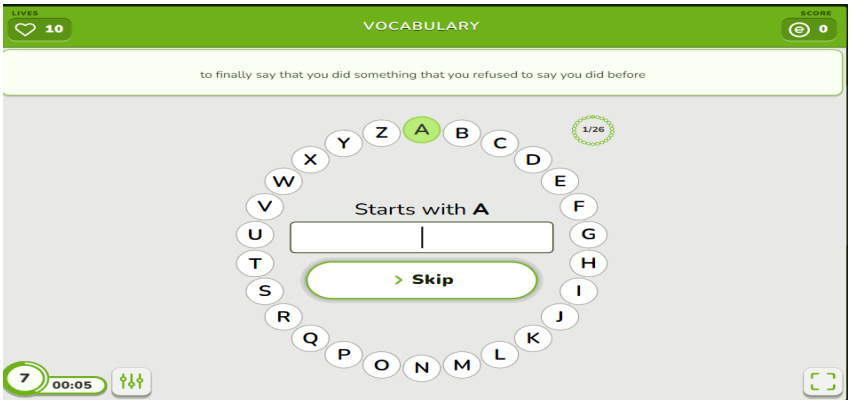

Figure 3. Educaplay Vocabulary roulette. https://es.educaplay.com/recursos-educativos/8947889-vocabulary.html

Quizizz is a gamified multiplayer quiz resource. Students access it via a code or PIN on their mobile devices. Features like question statements on mobile devices, assignment capabilities, Google Classroom integration, avatars, and motivational memes enhance the game feel and student engagement (Carrión, 2022). Quizizz adds a motivating and competitive component that increases student engagement through multiplayer quizzes with avatars, memes, rankings, and immediate feedback. Its intuitive design facilitates formative assessment and autonomous learning, aligning with evidence that demonstrates the usefulness of digital games for increasing motivation, engagement, and knowledge retention (Baah et al., 2024; Li et al., 2024). Figure 4 exemplifies a Quizizz task

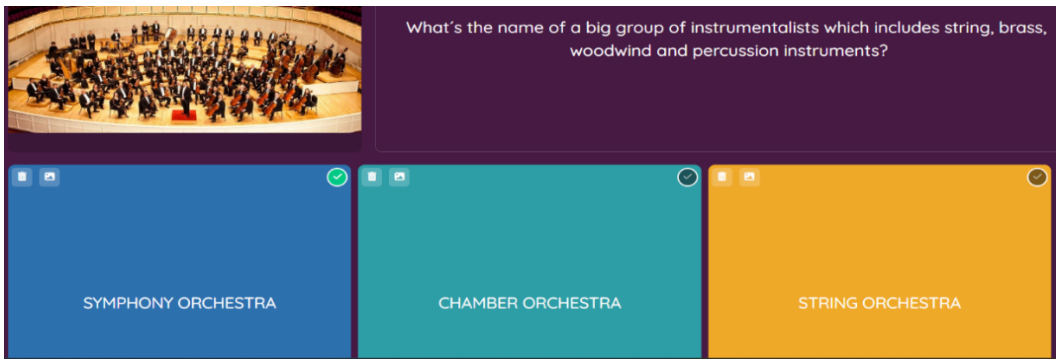

Figure 4. Quizizz. The Concert: The instruments of the orchestra. https://quizizz.com/admin/quiz/6094f49927e67b001f0e58f3?source=quiz_share

Students accessed the resources synchronously, answering 5 multiple-choice quiz questions individually, each worth 2 points, with scores ranging from 0 to 10 points. After completing the tasks, the results were discussed in class to address difficulties and reinforce learning.

A total of twelve games were designed, three with each platform (Genially, Nearpod, Educaplay, and Quizizz). These twelve gamified activities ensured a balanced use of the different tools throughout the proposal. These tools were used to review key course content in preparation for the exam, through interactive activities aimed at reinforcing essential concepts and facilitating their understanding. During the online sessions, the lecturer shared the activity live from their computer, allowing all students to view it simultaneously. Afterwards, the students answered the questions—a total of five multiple-choice items—cooperatively and collaboratively via the virtual platform's chat, thus creating a space for interaction and shared learning. Throughout the activity, the lecturer acted as a mediator and guide, supervising the process, answering questions, and promoting shared reflection, while the students took on an active role as protagonists of their own learning. Each activity included clear instructions at the beginning and was designed using editable templates, customized to ensure a coherent visual format and improve the usability of the resource, in line with the possibilities for creating visual and interactive content offered by these tools. Taken together, these four tools operate synergistically: Genially provides visual impact and exploration; Nearpod offers interactive structuring and participation; Educaplay supports autonomous, flexible practice; and Quizizz contributes motivation, healthy competition, and immediate feedback. Their integrated use allows the teaching–learning process to become an active, meaningful, and motivating experience, in line with the results of the study, which show improvements in students' understanding, motivation, participation, problem-solving, and digital competence.

3.4. Instruments

The research relies on the analysis of students' anonymous and individual responses to two questionnaires. A pre-planned online questionnaire was administered before and after the intervention to assess students' perception regarding their knowledge acquisition, teacher training, and motivation when using digital resources. The questionnaire was created with questions from the review of scientific literature (Carrión & Robrizo, 2022) that had already studied the impact of utilizing LKT tools. Students completed the questionnaires on the first (PRE) and last day of classes (POST) using their mobile devices, with the instructor present to guide them.

The PRE-questionnaire includes eighteen Likert scale questions (1: strongly disagree to 5: strongly agree) across three categories: knowledge acquisition (items 5, 7, 8, 9, 12, 13, 14, 16, and 17), teacher training (items 1, 2, 3, 4, and 18), and motivation (items 6, 10, 11, and 15). The POST-questionnaire comprises these eighteen questions plus six additional questions assessing the students' evaluation of new digital resources (items 19, 20, 21, 22, 23, and 24). In the appendix, both the pre-intervention and post-intervention questionnaires can be found.

Three judges, college professors specialized in the field, evaluated the content validity of the questionnaires. Their evaluations of importance, wording, expression, and coherence were analyzed using the kappa coefficient, resulting in

an appropriate value (0.89). The reliability of the questionnaires was assessed using Cronbach's alpha, achieving high levels for both the PRE (α = 0.910) and POST-questionnaires (α = 0.949).

3.5. Data analysis

First, the reliability and content validity of the PRE and POST-questionnaires were checked using alpha and kappa coefficients. Secondly, the normality of all questions in both questionnaires was tested using the Kolmogorov-Smirnov Test due to the large sample size (Yap & Sim, 2011). All questions showed significance levels of $p<0.05$, indicating non-normal distribution. Therefore, non-parametric statistics were used to compare the PRE and POST-questionnaire results. The Wilcoxon Signed Rank Test (W) with a significance level of $p=0.05$ was employed, and effect size was calculated using a biserial rank (95% confidence interval) to compare differences between the PRE and POST results. Effect size interpretation followed Coolican (2009). Statistical analysis was conducted using SPSS Statistics version 27 (IBM, 2016), and effect size was calculated using R version 4.1 (R Core Team, 2021).

4 RESULTS

This section presents the results of the two questionnaires administered to students before and after the didactic intervention, categorized into descriptive and inferential statistics. For all eighteen indicators assessed, post-intervention scores were significantly higher than pre-intervention scores, indicating an overall improvement in students' perceived learning.

4.1. Knowledge acquisition

The results of the PRE and POST-questionnaires indicate that the didactic intervention significantly improved students' knowledge acquisition on all questions. Table 1 displays the sum of the ranks, the W-score, the significance level, and the effect size. The increase in the POST-questionnaire scores is statistically significant across all knowledge acquisition questions, with effect sizes ranging from small to large in the group work (12) and training (13) questions. Consequently, students showed significant progress in their learning and knowledge acquisition. Specifically, students reported feeling more responsible for their learning, improved understanding, enhanced problem-solving skills, better learning outcomes, increased ability to work in groups, improved training in digital gamified resources and their professional application, updated digital resource knowledge, and enhanced self-evaluation skills in the subject. Based on these results, the first hypothesis is accepted. An increase is observed in students' perceived learning and performance, as well as in their digital competence and learning management.

	N	Rank Sum	W	p	Effect size
5.Protagonist Negative ranks	57	4527.00	3085	.002*	0.270
Positive ranks	100	7876.00			
Ties	188				
7.Comprehension Negative ranks	56	6357.00	7515	.000*	0.542
Positive ranks	179	21373.00			
Ties	110				
8.Resolution Negative ranks	59	6823.50	6715	.000*	0.486
Positive ranks	171	19741.50			

Ties	115				
9.Learning Negative ranks	76	7788.50	2662	.008*	0.209
Positive ranks	122	11912.50			
Ties	147				
12.Group work Negative ranks	26	2492.50	13894	.000*	0.899
Positive ranks	287	46648.50			
Ties	32				
13.Training Negative ranks	19	1784.00	14238	.000*	0.926
Positive ranks	290	46111.00			
Ties	36				
14.Application Negative ranks	69	7241.50	4270	.000*	0.327
Positive ranks	138	14286.50			
Ties	138				
16.Updating Negative ranks	43	4070.00	8959	.000*	0.671
Positive ranks	179	20683.00			
Ties	123				
17.Self-evaluation Negative ranks	55	5490.50	7747	.000*	0.568
Positive ranks	170	19934.50			
Ties	120				

Note. N = 345; *p < .05.

Table 1. Pre-test vs post-test comparative result in knowledge acquisition

4.2. Teacher training

The results of the PRE and POST-questionnaires show that the didactic intervention led to improvements in all questions related to students' training. Table 2 shows the sum of the ranks, the W-score, the significance level, and the effect size. The POST-questionnaire scores indicate statistically significant increases for all questions related to teacher training, with a medium effect size. Students experienced significant gains in their perception of teacher training in the subject. Specifically, they noted that the teacher's teaching style was more positive when using digital gamified resources in the classroom, and they viewed these digital gamified resources as innovative teaching tools, practical digital strategies for applying concepts to real-life situations, and valuable for providing feedback. Based on these results, the first hypothesis (H1) is accepted. There is a consistent improvement in students' perception of the methodological approach based on gamification.

	N	Rank Sum	W	p	Effect size
1.Teaching style Negative ranks	54	4784.00	6201	.000*	0.489
	139	13937.00			
Positive ranks	152				

Ties					
2.Teaching resources Negative ranks	57	5001.50	3639	.000*	0.304
Positive ranks	112	9363.50			
Ties	176				
3.Digital practice Negative ranks	53	4987.50	9530	.000*	0.680
Positive ranks	196	26137.50			
Ties	96				
4. Teaching strategy Negative ranks	67	7858.50	5217	.000*	0.382
Positive ranks	158	17566.50			
Ties	120				
18.Feedback Negative ranks	39	4113.00	7747	.000*	0.674
Positive ranks	185	21087.00			
Ties	121				

Note. N = 345; *p < .05.

Table 2. Pre-test vs post-test comparative result in teacher training

4.3. Motivation

The results of the PRE and POST-questionnaires show that the didactic intervention improved all questions related to student motivation. Table 3 shows the sum of the ranks, the W-score, the significance level, and the effect size. The POST-questionnaire scores indicate statistically significant increases for all motivation questions, with small and medium effect sizes. Students showed significant progress in their motivation for the subject. They reported increased interest, enhanced enjoyment of learning, greater participation, and a recommendation for using digital gamified resources in other college subjects. Based on these results, the first hypothesis (H1) is accepted. There is an increase in students' engagement and participation in the classroom.

	N	Rank Sum	W	p	Effect size
10.Interest Negative ranks	72	6599.00	3524	.000*	0.280
Positive ranks	119	11737.00			
Ties	154				
6.Enjoyment Negative ranks	69	7270.00	5809	.000*	0.428
Positive ranks	156	18155.00			
Ties	120				
11.Participation Negative ranks	93	11114.50	2510	.012*	0.185
Positive ranks	140	16146.50			
Ties	112				

15.Recommendation ranks	Negative	52	5245.50	7202	.000*	0.544
Positive ranks		162	17759.50			
Ties		131				

Note. N = 345; *p < .05.

Table 3. Pre-test vs post-test comparative result in motivation

4.4. Assessment of new digital resources

The results regarding the students' evaluation of the introduction and use of digital resources in college teaching are shown in Table 4. The data reveal that almost 94% of students almost always or always adapt easily to new digital resources in the classroom. Nearly 90% can initiate tasks independently using new digital resources applied by the teacher. About 72% question whether they understand the new digital resource well before applying it, and 52% do not fear using a new digital resource in the classroom, although 33% do express some concern. Additionally, 82% manage their nerves well when the teacher introduces a new digital resource, and 76% can use a new digital resource even if they have forgotten the teacher's explanation. These results align with the specific descriptive aim of the study. The majority of students show a high level of adaptation to new technologies. These results further support the evidence regarding students' receptiveness to digital and gamified methodology.

	1 (Never)	2 (Hardly ever)	3 (Sometimes)	4 (Almost always)	5 (Always)
19.I get used to the resource easily	0.3%	0.6%	6%	26%	67%
20.I do tasks with new resources	0.6%	0.3%	10%	28%	61%
21. I wonder if I understand the resource well	4%	6%	18%	31%	41%
22. I am worried about the new resources	34%	18%	15%	14%	19%
23.I control my nerves with the new resources	1%	3%	14%	27%	55%
24.I improvise with the new resources	2%	3%	19%	36%	40%

Note. N = 345

Table 4. Students' degree of satisfaction percentages

5 DISCUSSION

The results of this study show that the incorporation of digital gamified tools leads to significant improvements in the perception of university learning in both face-to-face and online environments. The differences observed between pre- and post-intervention measurements across the 18 indicators assessed confirm that gamification constitutes an effective pedagogical methodology for promoting active and motivating learning. These findings are consistent with previous research (Camacho et al., 2023; Huseinović, 2023; Lampropoulos & Sidiropoulos, 2024), which highlights the value of gamification as a strategy capable of increasing student engagement and satisfaction in digitised educational contexts. The results also show significant improvements in indicators linked to meaningful learning. Students reported that gamified

activities enabled them to learn in an enjoyable way, better understand course content, and solve problems more effectively. Likewise, an increase was observed in their perceived achievement of learning outcomes. These findings reinforce existing evidence (Erkinovna, 2024; Murillo et al., 2021; Opre et al., 2024) that gamification helps activate cognitive and affective processes that positively influence motivation and academic performance.

One of the most notable improvements relates to teaching style. Students perceived more positive teacher performance when instructors incorporated digital gamified tasks, which is in line with the literature suggesting that gamified approaches encourage more participatory, flexible, and student-centred teaching practices. Students also considered these activities to be an innovative resource that is superior to traditional practices, particularly for applying concepts to real-life situations and fostering autonomous learning in which they themselves assume a leading role. In this regard, De la Peña et al. (2021) note that gamified activities capture students' attention more effectively than traditional methods.

Regarding the motivational dimension, students reported increased interest in the subject, as well as higher levels of participation and willingness to work collaboratively. This aspect is especially relevant in digital or hybrid environments, where maintaining motivation is often challenging. Gamified dynamics, based on interactivity, appear to facilitate collective engagement and promote a more participatory learning experience, in line with Erkinovna's (2024) findings.

The study also provides relevant data on students' digital competence. Improvements in indicators related to training in digital gamified resources, knowledge of resources applicable to their future professional practice, and digital updating suggest that gamification not only supports content learning but also fosters the development of transversal skills. Self-assessment of learning and perceptions of teacher feedback improved significantly. Particularly noteworthy is the effect size of practical relevance observed for the indicator related to feedback, which underlines the importance of teacher support and scaffolding in gamified environments.

The results concerning students' appraisal of digital resources reveal that university students have a high level of digital adaptability. Most of the students reported that they easily become accustomed to new resources introduced in the classroom, can initiate activities with newly learned tools, and maintain emotional control while using them. They also indicated that they do not feel anxious about the introduction of new technologies and are able to improvise or reconstruct how to use them if they forget the teacher's instructions. This pattern indicates a high degree of autonomy and digital resilience, which are key aspects for the effectiveness of gamification in higher education contexts. The fact that students question whether they are correctly understanding what they are doing further suggests the presence of metacognitive processes that are useful for strengthening self-regulated learning.

Despite these positive results, recent research (Díaz & Estoque, 2024; Kabilan et al., 2023; Papadakis et al., 2023; Spathopoulou, 2019; Zeybek & Saygi, 2024) underscores the importance of considering certain challenges. The implementation of gamified strategies may be conditioned by cultural factors, technological gaps, or limitations in teachers' digital competence. It is also necessary to avoid gamification leading to excessively competitive dynamics, and instead to promote collaborative activities aligned with the intended learning outcomes (Ariffin et al., 2022). These elements are essential to ensure effective and equitable integration in diverse university contexts. Taken together, the findings of this study indicate that gamification, when accompanied by strong teacher mediation and supported by students' growing adaptive capacity to digital resources, is a valuable strategy for strengthening the quality of learning in higher education. However, its sustainability requires rigorous pedagogical planning, as well as institutional policies that guarantee adequate technological infrastructure and ongoing teacher training

6 CONCLUSIONS, SUGGESTIONS AND IMPLICATIONS

The current educational context necessitates that teachers utilize technological tools and active methodologies in the classroom and develop effective pedagogical strategies to make students active participants in their own learning (Fonseca et al., 2023), as our research demonstrates. With the use and implementation of these technological resources, we aim to improve and support the teaching-learning processes in various college subjects in both face-to-face and online contexts. Therefore, this work aims to offer teachers technological tools that can make their classes more engaging,

increase students' interest in learning, and enhance their motivation to participate in class (Torrado-Crespón & Díaz Lage, 2022).

The results of this study indicate improvements after the application of the didactic proposal in all evaluated aspects, including knowledge acquisition, teacher training, and student motivation. Regarding knowledge acquisition, the items of training and group work had an important impact and obtained large effect sizes (0.926 and 0.899, respectively), while the items comprehension, updating, and self-evaluation had certain relevance and obtained moderate effect sizes (0.542, 0.671, and 0.568, respectively), which meaningfully support the significant differences analyzed. Concerning teacher training, digital practices and feedback had certain importance and obtained moderate effect sizes (0.680 and 0.674, respectively), complementing the differences encountered. Finally, in the motivation section, the recommendation was also relevant and obtained a moderate effect size (0.544), further supporting the findings.

This methodology and the technological tools used facilitate meaningful learning through experiential activities, where students interact with the content in a playful manner supported by their digital devices, turning the classroom into a space for creative and motivating reflection. This interactivity with the content, classmates, and the teacher positively impacts learning, academic performance, and active collaborative engagement (Opre et al., 2024). Consequently, the implementation of gamified activities stimulates students' attention and interest more naturally than classical teaching methods (De la Peña et al., 2021).

The results of this study have valuable implications for higher education teachers. These results help us improve digital gamified resources that are oriented toward a learner-centered approach. Understanding students' motivations is crucial to shaping their beliefs and practices (Yang & Wyatt, 2021). Therefore, we should consider several practical pedagogical strategies to improve student motivation, as observed in this study. Firstly, colleges should offer more assignments and activities through which students can be assessed, taking into account their needs and expectations before and after a course. Secondly, teachers should increase the use of digital resources that can promote students' enjoyment while enhancing their autonomous learning. Thirdly, teachers should encourage peer collaboration and open discussions that support students' active participation, autonomy, and self-confidence in a safe environment (Lamb, 2017). Fourthly, teachers should use cognitive (i.e., elaboration to deepen understanding), metacognitive (i.e., planning to regulate the learning process), motivational, and management strategies to create an appropriate learning environment (Martín-González & Chaves-Yuste, 2024). Finally, teachers should encourage students to reflect on their learning to reinforce a sense of achievement and belonging to a group, thereby creating a positive learning environment.

However, this study has some limitations that must be considered. The sample size could be regarded as moderate and should include learners from a wider range of programs. Therefore, the results must be interpreted cautiously and should not be generalized to other contexts. Another limitation identified is the use of a single-group pre-test and post-test design; this choice was made to ensure the same instructor taught all students and all received the didactic intervention. However, scientific literature (Heine et al., 2023) suggests adopting different designs depending on the learning task. In this work, the same procedure and resources used to work with important course content, leading to the conclusion that the observed effect on participants' perceptions was due to the innovative proposal itself. Finally, concerning research methodology limitations, student assignment was done by convenience rather than randomly. To mitigate this, a preliminary analysis was conducted to verify that there were no differences in sociodemographic variables such as gender and age that could influence the results obtained in this study. Future research should examine a wider range of subjects from other fields to obtain a more diverse sample. Additionally, a longitudinal design could provide valuable insights into the development of students' knowledge acquisition, their perceptions of teacher training, and their motivation to learn with digital resources.

These contributions can be utilized to promote learning and suggest that we should rethink our didactic methodologies. We should reflect on what our students actually learn and what we want them to learn to meet the demands of society successfully. Therefore, we believe that our work demonstrates that gamification and the digital resources used are an alternative with significant formative potential for students. The main idea is to structure the university classroom around active and motivating learning situations where students can engage with the content as protagonists rather than mere

recipients, considering their interests in relation to the course content. This approach aims to make the practical component the central axis of the course organization, thereby contextualizing the methodological and epistemological themes without abandoning them.

Consequently, this work provides preliminary evidence of the benefits of implementing a gamification-based didactic methodology in a university context, encouraging further research to enhance educational quality. Additionally, this research proposes a didactic intervention with certain relevance that can be easily replicable by other researchers. Future studies can also focus on applying these principles to the curricular content of different disciplines and types of universities (in-person, hybrid, and virtual), supporting the benefits of technological tools and active methodologies in optimizing the quality of student learning.

All these considerations suggest that gamification is an emerging methodological approach, with its greatest potential being the engagement and motivation of students, which are key aspects of meaningful learning. Therefore, it is necessary to continue proposing training plans for teachers that allow them to understand and experience active methodologies, aiming for higher quality and effectiveness in educational processes.

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APPENDICE

PRE-Questionnaire

1. El estilo docente del profesor es más positivo si utiliza actividades con juegos digitales en el aula.
2. Las actividades con juegos digitales pueden ser un recurso docente innovador en el aula.
3. Las prácticas con juegos digitales en la asignatura serán mejor que haciendo prácticas tradicionales.
4. Las actividades con juegos digitales es una estrategia docente para aplicar los conceptos a situaciones reales.
5. Los estudiantes son los protagonistas y responsables de su propio aprendizaje gracias al uso de actividades con juegos digitales.
6. Las actividades con juegos digitales permiten aprender divirtiéndose.
7. Las actividades con juegos digitales mejoran la comprensión de la asignatura.
8. Las actividades con juegos digitales aumentan la capacidad de resolución de problemas relacionados con la asignatura.
9. Las actividades con juegos digitales incrementan los resultados de aprendizaje/ o mi aprendizaje.
10. Las actividades con juegos digitales aumentan el interés por la asignatura.
11. Las actividades con juegos digitales fomentan la participación de los estudiantes.
12. El uso de las actividades con juegos digitales fomenta el trabajo en grupo.
13. Estoy formado en juegos digitales.
14. Conozco varios recursos de juegos digitales para aplicar en mi futuro laboral.
15. Recomendaría el uso de actividades con juegos digitales en otras asignaturas en Educación Superior.
16. Las actividades con juegos digitales permiten actualizarte en recursos digitales.
17. Con las actividades con juegos digitales puedes autoevaluar tu aprendizaje.
18. Es posible que en las actividades con juegos digitales el profesor aporte feedback de la corrección de las actividades.

POST-questionnaire

1. El estilo docente del profesor es más positivo cuando ha usado actividades con juegos digitales en el aula.

2. Las actividades con juegos digitales han sido un recurso docente innovador en el aula.

3. Prefiero las prácticas con juegos digitales en la asignatura que con prácticas tradicionales.

4. El docente usando las actividades con juegos digitales ha permitido ver más claro la aplicación de los conceptos a situaciones reales.

5. Los estudiantes han sido los protagonistas y responsables de su propio aprendizaje gracias al uso de actividades con juegos digitales.

6. Las actividades con juegos digitales han permitido que me divierta aprendiendo.

7. Las actividades con juegos digitales han mejorado mi comprensión de la asignatura/tema.

8. Las actividades con juegos digitales han aumentado mi capacidad de resolución de problemas relacionados con la asignatura/tema.

9. Las actividades con juegos digitales han incrementado mis resultados de aprendizaje/ o mi aprendizaje.

10. Las actividades con juegos digitales han aumentado mi interés por la asignatura.

11. Las actividades con juegos digitales han fomentado más la participación de los estudiantes en clase.

12. El uso de las actividades con juegos digitales ha fomentado el trabajo en grupo.

13. Ha mejorado mi formación en juegos digitales.

14. He conocido recursos de juegos digitales para aplicar en mi futuro laboral.

15. Recomendaría el uso de actividades con juegos digitales en otras asignaturas en Educación Superior.

16. Las actividades con juegos digitales han permitido actualizarme en recursos digitales conociendo otro nuevo.

17. Con las actividades con juegos digitales he podido autoevaluar mi aprendizaje.

18. El profesor ha proporcionado feedback durante la realización de los juegos digitales.

19. Me acostumbro fácilmente a recursos digitales nuevos en el aula.

20. Considero que puedo iniciar actividades con los nuevos recursos digitales aprendidos.

21. Cuando uso un nuevo recurso digital me pregunto si lo entiendo bien o no.

22. Siento preocupación cuando el profesor introduce un nuevo recurso digital en clase.

23. Puedo controlar los nervios cuando uso el nuevo recurso digital.

24. Puedo improvisar cómo usar el recurso digital si se me olvida la explicación del profesor.

LUDIFICACIÓ I RECURSOS TECNOLÒGICS: EXPERIÈNCIES INNOVADORES PER A MOTIVAR I OPTIMITZAR EL PROCÉS D'APRENENTATGE EN CONTEXTOS UNIVERSITARIS

L'ús d'eines tecnològiques gamificades representa una pràctica pedagògica alternativa per potenciar el procés d'ensenyament-aprenentatge en l'educació superior. És fonamental que el professorat implementi estratègies innovadores que promoguin un aprenentatge actiu, significatiu i interactiu a l'aula. Aquesta investigació té com a objectiu determinar si la implementació de recursos digitals basats en la gamificació —Genially, Nearpod, Educaplay i Quizizz— millora l'avaluació de l'aprenentatge per part de l'estudiantat (en termes d'adquisició de coneixements, formació docent i motivació) tant en cursos presencials com en línia, en diverses disciplines de les ciències socials en l'àmbit universitari. Es va utilitzar un disseny preexperimental amb mesures abans i després de la intervenció, duta a terme durant un període de quatre mesos (n=345). Els resultats evidencien millores significatives en la percepció de l'estil docent, la innovació metodològica, la comprensió dels continguts, la resolució de problemes, la motivació, la participació i el treball col·laboratiu. A més, s'observa una major competència digital, autoavaluació i adaptabilitat a nous recursos digitals. Aquests resultats confirmen que la gamificació afavoreix un aprenentatge actiu, significatiu i autònom, consolidant-se com una estratègia eficaç en l'Educació Superior.

PARAULES CLAU: ludificació, educació superior, eines tecnològiques, competència digital, model espiral de competència TIC-LKT-*EPT

GAMIFICACIÓN Y RECURSOS TECNOLÓGICOS: EXPERIENCIAS INNOVADORAS PARA MOTIVAR Y OPTIMIZAR EL PROCESO DE APRENDIZAJE EN CONTEXTOS UNIVERSITARIOS

El uso de herramientas tecnológicas gamificadas representa una práctica pedagógica alternativa para potenciar el proceso de enseñanza-aprendizaje en la educación superior. Es fundamental que el profesorado implemente estrategias innovadoras que promuevan un aprendizaje activo, significativo e interactivo en el aula. Esta investigación tiene como objetivo determinar si la implementación de recursos digitales basados en la gamificación—Genially, Nearpod, Educaplay y Quizizz—mejora la evaluación del aprendizaje por parte del estudiantado (en términos de adquisición de conocimientos, formación docente y motivación) tanto en cursos presenciales como en línea, en diversas disciplinas de las ciencias sociales en el ámbito universitario. Se utilizó un diseño preexperimental con mediciones antes y después de la intervención, llevada a cabo durante un período de cuatro meses (n=345). Los resultados evidencian mejoras significativas en la percepción del estilo docente, innovación metodológica, comprensión de contenidos, resolución de problemas, motivación, participación y trabajo colaborativo. Además, se evidencia mayor competencia digital, autoevaluación y adaptabilidad a nuevos recursos digitales. Estos hallazgos confirman que la gamificación favorece un aprendizaje activo, significativo y autónomo, consolidándose como una estrategia eficaz en Educación Superior.

PARAULES CLAU: gamificación, educación superior, herramientas tecnológicas, competencia digital, modelo espiral de competencia TIC-LKT-EPT