Innovación Educativa en el ámbito de las TIC y las TAC

Proyectos, Métodos y Herramientas para el Futuro de la Educación

Grupo de Aplicaciones Tecnológicas para la Enseñanza de las TIC (ATETIC)

Universidad de Las Palmas de Gran Canaria

ATETIC

ULPGC • UNIVERSIDAD DE LAS PALMAS DE GRAN CANARIA

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Gamification in higher education, the experience at ULPGC

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ABSTRACT

University professors are looking for ways to strengthen students' emotional and behavioral engagement in the classroom in order to improve their learning and increase their performance. One of the strategies used to achieve these goals is gamification, a term introduced in 2002 by video game developer Nick Pelling. This technique involves incorporating game elements and dynamics into non-game contexts [1]. The use of gamification in education has grown rapidly due to its great potential to motivate and engage students [2]. At the University of Las Palmas de Gran Canaria (ULPGC), various gamification initiatives have been implemented as part of educational innovation projects to provide a more engaging and meaningful learning experience in different Faculties. These experiences have involved more than 1000 students and have used tools such as Kahoot, Quizziz, and Wix to develop and assess gamification, along with additional resources like Educaplay and Powtoon to create games and dynamics. The results show an increase in students' motivation, participation, and engagement in the subjects, highlighting the importance of educational games and gamification in teaching due to their impact on student motivation, reducing monotony, and presenting learning materials in a more effective and entertaining way.

Keywords: Gamification, educational innovation, higher education.

1. INTRODUCTION

Providing a truly engaging and meaningful learning experience for university students can be a significant challenge. In this context, higher education faculty are looking for ways to enhance students' emotional and behavioral engagement in the classroom, with the aim of improving their learning and boosting their academic performance. One of the strategies applied to achieve these goals is gamification, a term introduced in 2002 by video game developer Nick Pelling. Gamification involves using game elements and design techniques in non-game contexts [1]. Its implementation in the educational field is growing rapidly, mainly due to its ability to motivate and engage students [2].

According to [3] mention that one of the 17 goals of the United Nations' 2030 Agenda is to ensure inclusive, equitable, and quality education and to promote lifelong learning opportunities for all [4]. Active methodologies, which place the student at the center of the learning process, are becoming more prevalent and have been shown to contribute to higher quality education [5,6].

Gamification presents a significant challenge for education, particularly in higher education institutions [7]. Teachers have transformed traditional environments into more dynamic and engaging spaces through the implementation of new teaching strategies, turning conventional classes into novel and interesting experiences [8].

Various studies have shown that incorporating gamification in the university setting improves both academic performance and student motivation and participation [9,10,11]. Numerous studies highlight gamification as an effective technique for increasing student engagement [12]. This educational strategy impacts students on behavioral, emotional, and cognitive levels, fostering their interest and active participation in the teaching-learning process [13,14]. A study that explored these aspects [15] revealed a significant increase in behavioral, emotional, and cognitive participation. These findings align with those of a recent meta-analysis [16], which systematically analyzed the effects of gamification on cognitive, motivational, and behavioral learning.

Moreover, regarding students' perceptions of gamification in the classroom, it has been found that they enjoy participating in these activities and consider them a valuable learning experience [17]. Previous studies have also found that students prefer gamification applied to academic content over traditional classroom experiences [18]. [19] emphasize that these activities allow students to learn from their peers and view course materials from a different perspective.

A literature review [20] on university students' perceptions of gamification confirms the growing interest in the scientific community in exploring its application in higher education. Furthermore, it confirms the positive attitude of students toward the development of innovative educational experiences based on gamification. [21] evaluated the impact of a gamified experience implemented with final-year medical students, using levels, badges, and motivational messages. Over the course of a complete program, the authors measured student behavior and interaction with the technology longitudinally. The results suggest a positive impact of gamification throughout the course [22].

However, for gamification to be effective, it is essential to have a well-designed framework, as a poorly structured approach can negatively impact student learning and motivation [23].

In this work, we want to present the efforts being carried out at the University of Las Palmas de Gran Canaria regarding gamification, aimed at improving students' motivation towards learning. We show how gamification has been promoted through the framework of educational innovation projects at the university with several examples of gamification experiences developed in different Faculties, describing them and providing their results, and concluding with findings on these.

2. GAMIFICATION WITHIN EDUCATIONAL INNOVATION PROJECTS: METHODOLOGY AND PROJECTS

The transformation of our society has prompted the University to adapt and incorporate academic and training changes to continue being a driver of social development. This has led to a revaluation of teaching and educational innovation [24]. In this context of methodological innovation and the interest in increasing student learning and active participation, this work is situated. In this regard, the University of Las Palmas de Gran Canaria (ULPGC) has embraced gamification in its teaching, and we will present some of the experiences currently underway.

First and foremost, it is important to highlight the strategic interest of the University of Las Palmas de Gran Canaria. Optimizing the learning experience for students is one of the university's priorities, as demotivation, lack of engagement, and academic failure are directly related to social exclusion and various health issues. Furthermore, there is scientific evidence showing that students with good performance are more likely to successfully face their future professional and social challenges, as well as cope with the demands of today's information society [25].

According to the V Institutional Strategic Plan of the University of Las Palmas de Gran Canaria, we align ourselves with the proposed actions to improve the teaching function of the university. Specifically, the following objectives are highlighted:

- Objective [GEN11.4]: Promote the incorporation of new technological resources into teaching, in collaboration with the action.

- Objective [GEN12.1]: Encourage the use of innovative teaching methodologies, both general and specific, that align with the degrees and interests of the Center.

Once the educational innovation projects based on gamification that have been developed at the university are identified, we will briefly discuss them. Now, focusing on the first experience that will be presented in this work, the educational innovation group GIE-35: Motivation and Emotion in Education aimed to provide a more attractive and meaningful learning experience in the content block of Family and School, present in the Bachelor's Degree in Primary Education and the Master's Degree in Teacher Training for Compulsory Secondary Education and Baccalaureate, Vocational Training, and Language Teaching at the Faculty of Education Sciences (subjects of Society, Family, and Education Relations in the master's program and Educational Theory, School, and Family in the bachelor's program).

This educational innovation project aimed to utilize gamification to foster a student-centered learning approach, with the intention of enriching their learning experience and making parental education content more accessible and engaging. In summary, the goal is to enhance student learning through actions that impact their motivation.

In the initial phase, Kahoot (Figure 1) was used to conduct a baseline assessment, from which a gamification experience was developed on the Wix platform (Figure 2). Within the context of a "spy school," students completed missions related to the subject matter, allowing them to advance in rank, earn rewards, among other benefits.

Figure 1. Kahoot for the initial assessment.

A total of 354 students from the Faculty of Education participated, of which 207 were enrolled in the Master's in Teacher Training for Compulsory Secondary Education, Baccalaureate, Vocational Training, and Language Teaching, while 147 were in the Bachelor's Degree in Primary Education. The average age was 24.7 years (SD = 7.3), with 69.5% being female. The evaluation of this proposal was carried out by administering a questionnaire to the students, which collected their perceptions about the experience of gamification as a learning activity and their preferences regarding a conventional teaching session. Responses were given according to a 5-point Likert scale, ranging from total disagreement to total agreement.

Figure 2. Gamification developed in Wix.

On the other hand, the Educational Innovation Group in Marine Sciences (GIEMAR) observed low participation and motivation among students during theoretical and practical sessions, which led them to implement active teaching methodologies to increase student engagement in their own learning process. As part of this initiative, they created a question bank with student involvement as an evaluative activity, selecting some for the "Oceans Contest." They also adapted general knowledge questions to present at the Sea Fair, where they received a positive response. Additionally,

they are developing a version of the contest for secondary and primary school students, where they take the opportunity to talk about the Bachelor's Degree in Marine Sciences and raise awareness about issues such as pollution and climate change. The collaboration of a secondary school teacher in the Educational Innovation Project (PIE) allowed for adjustments to the questions according to different levels of difficulty.

To facilitate mastery of the content, it is proposed that students engage in autonomous learning guided by the teaching staff, promoting their commitment and raising relevant questions about the topics covered in each subject. These questions, once discussed and worked on with the teacher, will become part of the aforementioned question bank, which will be used as study material for the entire class (for example, through gamification) and for assessment, including a selection of them in quizzes or official exams. This approach fosters skills for managing and structuring information, using platforms like Quizziz.

The study conducted by other colleagues focused on analyzing the Scratch programming language as a pedagogical tool for teaching functions [26]. It was necessary to implement didactic tools that would facilitate the understanding of concepts in a simple and engaging way. Given the traditional teaching and learning approach, it was important to organize more dynamic, participatory (Figure 3), and collaborative classes, where students would take an active role in their learning process, and the teacher would adopt a less traditional role as a guide. Within this framework, several activities were developed using Scratch: one focused on linear and affine functions, another on quadratic functions, and a third on exponential functions. The study involved 30 future teachers of the first course and employed active teaching methodologies, such as gamification, to increase motivation and promote students' autonomy in their learning. The motivation behind the activities presented was to offer pedagogical alternatives, considering Scratch as a tool for constructing and understanding reality.

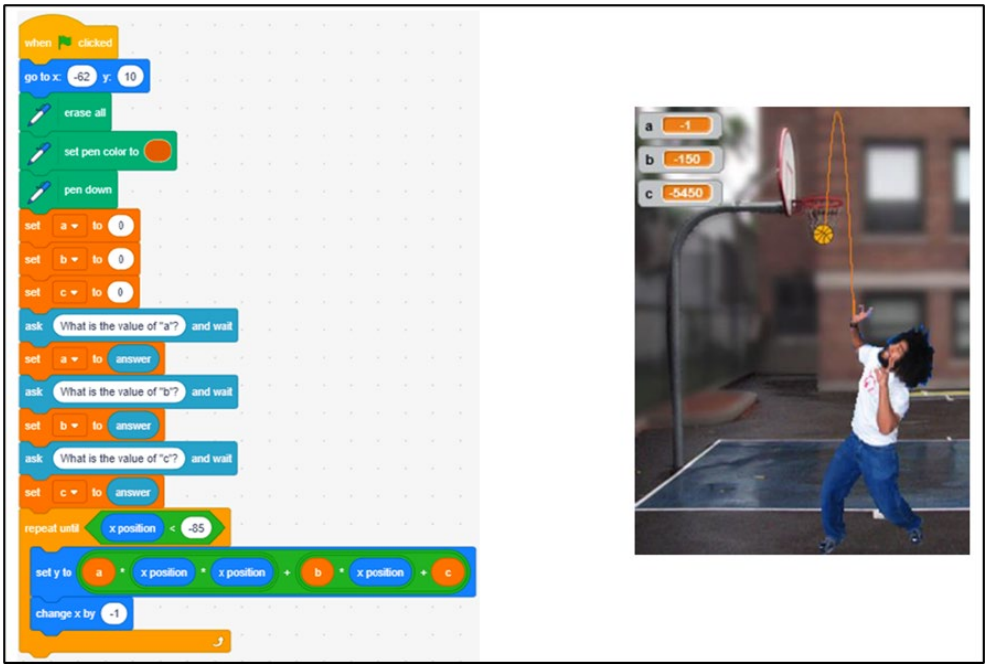

Figure 3. Scratch program and parabola (Quevedo & Zapatera, 2021, Figure 6, p. 9).

The educational innovation group GIE-64: Multidisciplinary Teaching Innovation Methodology (Teach-Inn) aimed to shift from the traditional lecture format, where the student is a passive participant, to an approach that promotes active student engagement, favoring meaningful learning of the content. With this goal in mind, they designed two card games for pairing, using incomplete cards that students had to complete (Figure 4). These activities were associated with the School of Architecture, the Faculty of Marine Sciences, and the School of Industrial and Civil Engineering, implemented with first-year students.

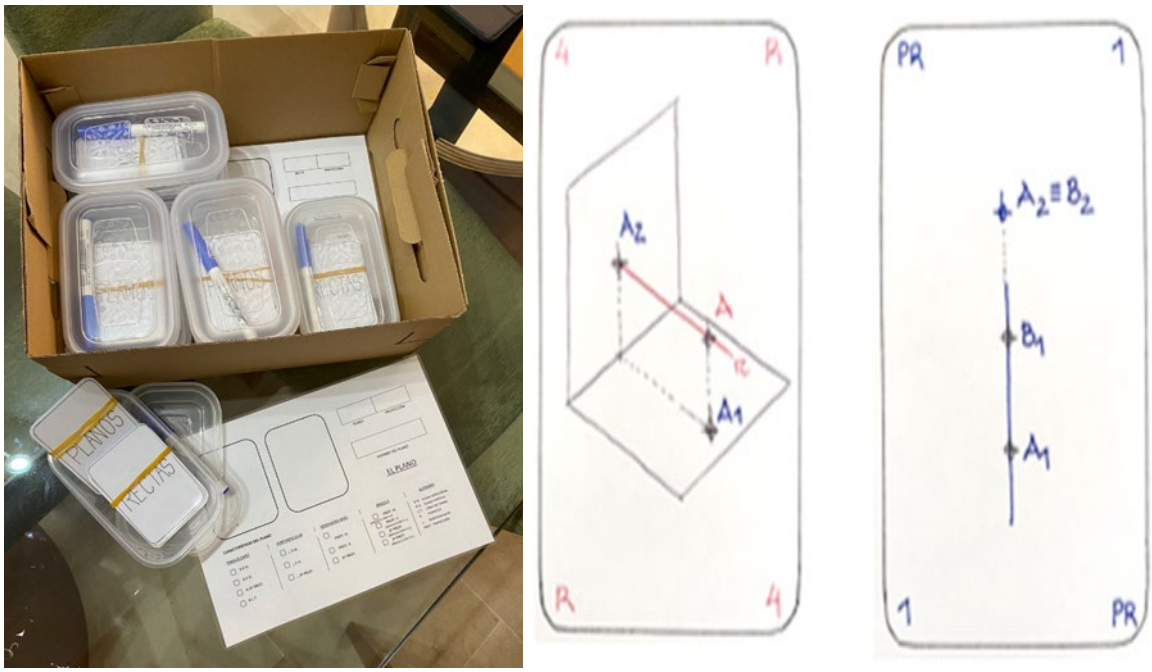

Figure 4. Cards used for the pairing identification task

The common objectives of this initiative included learning by doing, collaborating with peers, facilitating the understanding and memorization of concepts, developing social skills, and improving communication among students. Additionally, there were specific objectives related to the content of each discipline; for example, in architecture, some cards contained incomplete drawings that students were required to finish.

Fifteen double-sided cards were created, that allowed the 120 participating students to complete the characteristics of the identified element and take photographs once they had recognized the pair. At the same time, a questionnaire on the topic to be covered was designed and administered before and after the activity. Additionally, two other questionnaires were developed, which were only given to the group that participated in the card game; one assessed the game as a learning methodology (with a sample of 45 students), and the other focused on the game as a recreational object (with a sample of 41 students).

3. RESULTS

In relation to the first experience, the four benefits outlined in its objectives were evident. The data indicates that gamification has a positive impact on students' perceptions of their own learning. It allowed them to enhance their knowledge of the subject (M=4.23, SD=0.96) and to learn more through the gamified experience compared to more traditional teaching activities (M=4.03, SD=1.09). Students feel that the implementation of gamified experiences improves academic outcomes (M=3.94, SD=1.10), contributes to increased participation (M=3.83, SD=1.10), and believe that gamification has heightened their motivation towards the course content (M=3.93, SD=1.09). Overall, the experience was rated very positively (M=4.43, SD=0.71).

Another significant outcome relates to training, as this work facilitated the development of training for university faculty aimed at promoting gamification in higher education classrooms. This led to greater integration of gamification across various subjects through the design of activities and exercises, identifying the objectives that could be addressed using this methodology.

Additionally, it has extended into educational research, with several presentations at conferences and the future development of a doctoral thesis in which gamification will be a key component to improve the nutrition of young people with ADHD.

Regarding the second mentioned experience, the actions taken provided an opportunity to carry out educational and awareness-raising activities on environmental topics across different subjects. University students were involved in these visits. Moreover, the transfer of knowledge to secondary education institutions through an adapted version of the Ocean Contest represented a sharing of experiences and content beyond the traditional academic context.

They have contributed various communications to InnoEducaTIC24.

According to the third study presented, the participants evaluated the activities, methodologies, and assessment system with scores above 4 on a 5-point Likert scale in all cases, showing a clear preference for active methodologies over traditional lectures. The results indicate that the students found the activities motivating and acknowledged that the combination of the proposed methodologies represents an effective alternative to the traditional lecture. The approach to learning functions through Scratch became a playful experience in itself, allowing students to experiment with different options without fear of making mistakes, which, in many cases, increased their interest in continuing to explore and improve their results.

On the last described experience, related to the use of games as a learning methodology, 46.67% of the students felt that the game facilitated understanding and retention of the concepts addressed through a playful experience. 68.89% believed it promoted collaborative participation among group members and the creation of scaffolding structures, understanding this as mutual support among students to achieve a common goal. 53.33% felt that the dynamics of the game encouraged active learning, where the student becomes the protagonist of their educational process. 64.44% of respondents noted that classes incorporating these playful methodologies were more motivating and enjoyable due to the active involvement of students in their own learning and that of their peers.

The card game proved to be more effective as a learning methodology compared to the traditional lecture format while fostering collaboration among students, who help each other achieve a common goal.

Members of this group have presented several posters at the EDUNOVATIC24 Congress and plan to submit a manuscript for publication in a scientific journal with the final results of the experience next year.

Finally, it is noteworthy that various international universities are interested in collaborating on joint projects with ULPGC, such as the Department of International Business at KROK University (Ukraine), where students participate in the game "Project Manager," a small gamified strategy that illustrates the main qualities of a project manager. Additionally, Ivan Franko National University of Lviv (Ukraine) has included a course on Gamification in Business in its academic offerings and has facilitated gamified experiences in the methodologies of humanities, economics, social sciences, and computer technologies.

4. CONCLUSIONS

We believe that these innovative proposals can be beneficial for both faculty and students at the university, as their implementation could have a positive impact in the classroom, including improvements in learning, participation, motivation, and student performance. Additionally, they promote important skills such as teamwork, leadership, creative thinking, and communication, which are essential for achieving the competencies required in academic programs [27,28,29,30].

By integrating gamification into the design and development of courses, students could change their habits in class, improving their participation, productivity, and skills. This would allow for more meaningful, fun, and accessible learning [31].

In summary, the relevance of educational games and gamification in the learning and teaching process is evident due to their ability to increase student motivation, reduce monotony, and present material more effectively and attractively. This strategy can engage students with the content and, in turn, improve their academic performance. Games can serve as a motivational boost for students, making learning more engaging and exciting.

The inclusion of gamification in the educational process in higher education is feasible, as there are numerous options and platforms available for implementation. The various tools that will be used can be applied to any university course, adapting the content to the structures and dynamics of the proposed gamification.

It is crucial to conduct more empirical research to compare different teaching methodologies and examine how these experiences affect both students' final grades and their level of motivation. The gamified learning environment used in these experiences can be replicated in other university classrooms due to its versatility. This can be achieved either by simply using the same games while changing the academic content specific to each teacher/subject (the base and administration of the game only require a modification of the narrative), or, if the content is shared, the games themselves can be adapted to other objectives based on each teacher's needs for delivering their subject (developing the game using Genially's capabilities instead of Quizziz, completing fewer missions than planned because the work objectives are more modest, etc.).

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