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# Gamifying the university classroom: a comparative analysis of game dimensions through educational Escape Room and a digital board game

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**Introduction:** University education is looking for innovative ways to enrich the teaching-learning process.

**Methods:** This study aims to describe and compare two gamified experiences: an educational Escape Room and a digital goose board game with Genially. The design of this research follows a quantitative correlational methodology. A total of 135 university students in the first year of the Bachelor's Degree in Primary Education participated in the study.

**Results:** Data were collected using the Gamified Game Experience Scale (GAMEX). The results of contrasting means for the game dimensions between both gamified experiences reveal a significant variability ( $p < 0.01$ ) in favor of the Escape Room in fun, absorption, creative thinking, activation and mastery. On the other hand, the absence of negative affect was significant ( $p < 0.05$ ) in favor of the digital board game.

**Discussion:** It could be said that the educational Escape Room manifests itself as a powerful resource for learning. However, it can induce a high level of stress, generating discomfort, hostility and frustration in students, so its implementation is not free of negative effects. These findings provide additional empirical evidence that could guide the design of gamified experiences in the Higher Education environment.

## KEYWORDS

Escape Room, Genially, gamification, GAMEX, Higher Education

## 1 Introduction

Nowadays, we live immersed in a changing society in which teachers face new challenges in the context of Higher Education (Prieto Andreu, 2020). Today's educational scenario requires modifying traditional teaching methods and implementing methodologies adapted to the interests and needs of students (Anane, 2022; Li et al., 2023). One of the greatest challenges emerging in the university classroom stems from the need to implement innovative procedures through gamification that promote motivation for learning (González-Yubero et al., 2023). In this line, the evidence obtained in the field of

neuroscience in relation to the importance of emotions in learning highlights the need for students to find the greatest possible support from the educational community in their emotional and social development process through resources whose main pillar is the stimulation of motivation (Prieto Andreu, 2020). In this context, gamification emerges, which is defined as the use of strategies, models, dynamics, mechanics and game elements in non-playful contexts to convey a message or content, or to change behaviors through a playful experience that promotes participation, involvement and fun (Llorens et al., 2016, p. 25). Several investigations corroborate that fun as a learning formula should be linked to the educational environment (Pozo-Sánchez et al., 2022; Prieto-Andreu et al., 2022), overcoming the master lesson model, where memory is the center of learning. It is therefore a matter of enhancing learning from the design of innovative methodologies such as the educational Escape Room or digital board games, capable of promoting fun, absorption toward the task, creative thinking when solving challenges, cognitive activation and the feeling of mastery during the game, while experiencing pleasant emotions in the students (Parra-González and Segura-Robles, 2019; Navarro-Mateos and Pérez-López, 2022).

## 1.1 Gamification through educational Escape Room

Educational Escape Rooms can be defined as live action games based on teamwork in which participants discover clues, solve puzzles and perform tasks in one or more rooms to achieve a specific goal (usually escape from the room) in a limited time (Nicholson, 2018). Currently, the educational Escape Room is a booming resource because they increase student motivation toward learning (González-Yubero et al., 2023) and the development of inter- and intrapersonal competencies that can be enhanced through game design (Villalustre and Moral, 2015; Veldkamp et al., 2020). In order to implement an Escape Room, it is necessary to clearly establish the didactic objectives and specific competencies that are to be enhanced through the game (Rodríguez and Santiago, 2015). Likewise, it is necessary to establish the cycles of the activities and look for resources and materials that are more creative and motivating for the students. The riddles or challenges that teachers design can be based on mathematical, logical or search tests, among other options. The way in which these riddles will be placed in the room also depends on the narrative and the objectives pursued, since a linear or multilinear route can be established for the development of the game (Wiemker et al., 2015). Traditionally, this alternative leisure option, was born in a linear format. That is, players went from court to court, from lock to lock and, from room to room (where appropriate). But now we can also speak of multilinear games, which are those in which two or more lines of clues, puzzles or puzzles can be developed simultaneously throughout the game.

When we think of an escape game, we probably think that the fundamental part is in the enigma, in the challenge, in its creation and design. However, as in the rest of the games, the enigma in isolation has no function, so it is necessary to create mechanisms and narratives that give coherence to the game and connect the different ludic elements (Negre and Carrión,

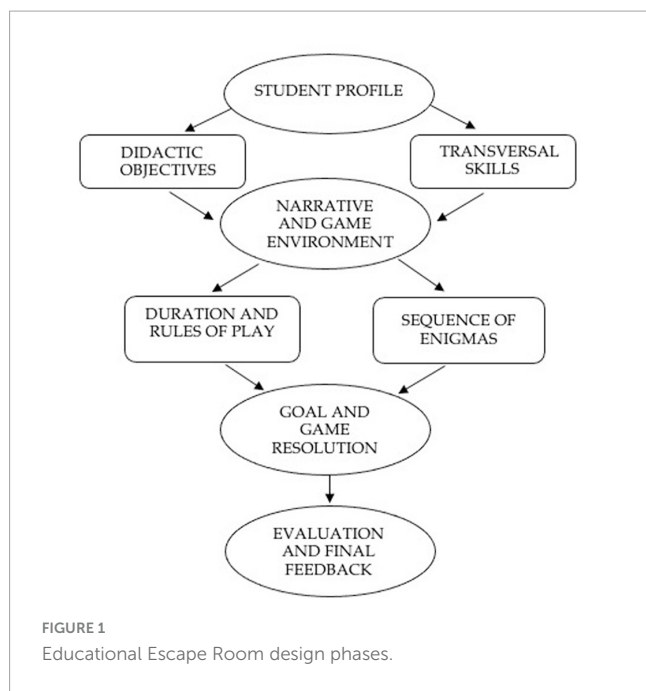
2020). Although Escape Rooms in physical environments offer more opportunities to collaborate than virtual environments (Ang and Liew, 2020), in both cases there are benefits for learning (Morrell and Ball, 2019) and improvements in academic motivation (González-Yubero et al., 2023) and performance of university students (Brady and Andersen, 2021). In the context of Higher Education, educational Escape Rooms are becoming an innovative methodological tool applied to various branches of knowledge, since proposals have been implemented in Health Sciences (Nybo et al., 2020), Engineering (De la Flor et al., 2020), or Education (García-Tudela et al., 2020) degrees, among others.

A previous study show that the implementation of educational Escape Room in the Higher Education environment, makes students have to work collaboratively, testing creativity and critical thinking in solving challenges in a limited time (Fotaris and Mastoras, 2019). The results of some research with university students show positive values in enjoyment/fun, degree of absorption, creative thinking, sense of mastery and student activation toward learning (Anguas-Gracia et al., 2021; Navarro-Mateos and Pérez-López, 2022; González-Yubero et al., 2023). On the other hand, it is worth highlighting that some studies confirm the experience of negative affect or unpleasant emotions during the Escape Room game in university students (Soler et al., 2020; Anguas-Gracia et al., 2021; González-Yubero et al., 2023). Since there are very few studies that provide information in this line and different instruments and data collection techniques have been used, we consider it interesting to learn more about whether this methodological strategy could enhance the dimensions mentioned above (fun, absorption, creative thinking, activation and the feeling of mastery during the game), while reporting a high level of negative affect in students (annoyance, hostility, frustration and stress). This fact could provide useful information for teachers when choosing and designing the best gamification strategy according to the didactic objectives and the learning climate they wish to foster in their classrooms.

### 1.1.1 Educational Escape Room design in the Higher Education classroom

The Escape Room presented in this study was constructed by means of five riddles, taking as a reference each of the subjects taught in the Didactics and School Organization course taught at the University of Zaragoza. Each test led to obtaining a number that formed a final five-digit key. This key unlocked a safe containing the key to the classroom to escape and a map of the faculty indicating the location to find the final reward. The winning team received a few tenths of a point increase in their final grade for the course, although this was not communicated until after the playful experience was over. To make the experience truly immersive, we used a safe, old newspapers, boxes with padlocks, markers, blue light flashlights, as well as disturbing videos that enriched the narrative story of the Escape Room.

For the design of the educational Escape Room, a series of phases were followed, as shown in the following diagram (see Figure 1). The first phase of the design of the Escape Room consisted of adapting the game to the profile of the target audience, in our case university students in the first year of the Primary Education Teaching Degree. It is essential that the Escape Room takes into account the age and academic level of the students



when designing it. Afterward, the learning objectives were planned and the technical and transversal competencies that we wanted to promote through the experience were specified. Subsequently, we designed the narrative and the setting, which are central elements for the game to be immersive and for the students to be motivated to learn. The same goes for the creation of the rules and the duration of the game, which will be linked to the design of the previous phases. Likewise, it was necessary to create and design enigmas related to the academic subjects taught that will lead to the planning of the last point of the game, the climax or final goal, with the resolution of the educational Escape Room. Finally, a last important phase is to design how we are going to evaluate and how we want our students to give us feedback to improve in future editions of the game (see [Figure 1](#)).

## 1.2 Gamification through digital game (Genially)

Digital gamification is a common and widespread practice in education. The spectacular increase in its use, the expansion of formats, the proliferation of Wi-Fi networks and smartphones, as well as its variety of possibilities, platforms and resources make the digital game a tool with great potential ([O'Riley, 2016](#)). Among its uses, beyond fun and entertainment, are didactic applications and its use in Higher Education. Its implementation in educational environments promotes the teaching of content, as well as the development of abstract thinking and argumentation, developing multiple skills from a didactic and playful dimension ([Herrero et al., 2020](#)). Learning based on digital games allows the development of skills in information and communication technologies (ICT) as well as the digital competencies currently demanded by society. A virtual game may fit a particular pedagogical need, a particular audience, a particular set of objectives and constraints and, at the same time, that game may not be appropriate in a different context

([Prieto-Andreu et al., 2022](#)). We need to understand not only whether a digital game or a gamification strategy can teach, but also the conditions under which it can -or not- help someone to learn ([Contreras-Espinosa, 2016](#)).

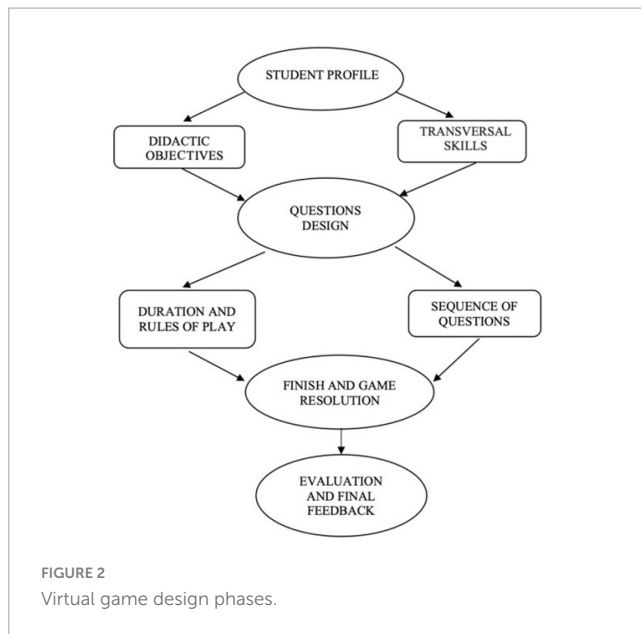
As can be seen, digital gamification is an active methodology that is booming in the context of Higher Education, as evidenced in the review by [Alonso-García et al. \(2021\)](#). The wide range of gamification platforms employed in the selected studies shows the diversity of uses of digital gamification and the multitude of tools that can be useful for this purpose. Despite all the technological, social and economic innovations that have allowed us to create, reproduce, replicate and research games, we cannot overlook the many forms that games can take. Games, whether digital, hybrid, analog, virtual, online, offline, console, web or mobile; they are games. Humans have been playing and learning from games since the dawn of humanity and we cannot forget that, at their most basic essence, they help us share and communicate who we are. For these reasons, it is an appropriate time to consider the connection between games and learning.

### 1.2.1 Design of a digital board game (Genially) in the Higher Education classroom

For the digital board game experience, a virtual game similar to the traditional goose game was designed through the Genially application. As for the design (see [Figure 2](#)) of this board game, a structure similar to the design of the educational Escape Room was followed based on the profile of the students and the didactic objectives set. The Genially application was used for its design based on the model of the traditional Spanish goose game. The players, who played in teams of four people in the classroom, chose a token and competed to see who could reach the goal first, rolling the dice and moving to the corresponding square. Each square was a question. The questions addressed subject content similar to the educational Escape Room experience. Challenges of a playful nature were also introduced, such as “sing a song with the elements of the curriculum” or “make up a poem listing the active methodologies.” The game lasted the same time as the educational Escape Room; 40 min. Both games are implemented by the same teacher for all groups.

Previous research in Higher Education showed that the use of games designed through the Genially application were effective in improving transversal skills and competencies ([Castillo-Cuesta, 2022](#); [Poveda Pineda et al., 2023](#)). Likewise, another study showed that those who experienced gamification dynamics through games implemented with Genially enhanced interest in classroom activities ([Reina-Guzmán et al., 2022](#)). Also in non-university population, an increase in student motivation has been evidenced through the use of Genially as a tool to gamify the classroom that significantly improved academic performance ([Castro-Salinas and Ochoa-Encalada, 2021](#)). However, recent studies have not analyzed this methodological strategy with Genially through the dimensions mentioned above (fun, absorption, creative thinking, activation and the feeling of mastery during the game) so this analysis can provide useful information to teachers to choose the best methodological option depending on the type of game they wish to implement in the classroom.

Gamification is a concept that stems from the learning provided by games, their mechanics, tools, developments, coping and the



way in which people are satisfied through the offer of rewards and/or stimuli for tasks carried out in one way or another in areas not necessarily related to games. The Genially gamified experience was carried out within a sequenced structure of gamified activities, where the objective was to work on the contents of the subject in a fun way, with its mechanics and challenges, in a non-playful space such as the university classroom (Contreras Espinosa and Eguia, 2017, p. 23). The Genially board game was designed by the teacher for a specific student body, with specific content and a structure of gamified activities for the entire academic year. We tried to maximize the students' skills through experimentation and play, since we believe that through experience and fun it is easier to achieve more meaningful and functional learning.

In addition, following Werbach and Hunter (2012) the Genially game had its dynamics with achievements, its mechanics and rules, and its components with ranking and avatars.

## 2 Justification and objectives

After a review of the literature, we observed that there are no previous studies that analyze in a contrasted way the game dimensions (fun, absorption, creative thinking, activation, mastery and absence of negative affect) that enhance each of the gamified experiences that we present: educational Escape Room and digital goose board game with Genially. Given the limitations found in previous research, this work is proposed with the aim of providing additional empirical evidence to help guide the design of gamified experiences in the Higher Education environment. Therefore, this work proposes the following research hypotheses:

Hypothesis 1: Significant differences will be found in the dimensions of fun, absorption, creative thinking, activation and mastery in favor of the educational Escape Room after the experience of university students in both gamified situations.

Hypothesis 2: Significant differences will be found in the dimension of absence of negative affect in favor of the digital goose board game with Genially after the experience of university students in both gamified situations.

## 3 Materials and methods

### 3.1 Participants

A total of 135 students in the first year of the first degree in primary education at the University of Zaragoza participated in this study. Of these students, 17.8% were men and the rest were women, with a mean age of 18.6 years ( $SD = 2.9$ ). The participants were selected through a probabilistic and intentional sampling. The justification for this selection is based on the fact that the researchers have taken as study subjects the students participating in the gamification experiences. As has been shown in other impact studies (Chou and Feng, 2019; Pozo-Sánchez et al., 2022) the sample size does not imply a bias in this type of study.

### 3.2 Instrument

Gamified Game Experience Scale (GAMEX, Eppmann et al., 2018 validated in Spanish population by Parra-González and Segura-Robles, 2019). This self-report evaluates gamified experiences. It is composed of 27 items grouped through six subscales assessed through a five-point Likert scale (1 = Strongly disagree; 5 = Strongly agree): Fun e.g., "playing was fun"; Absorption e.g., "playing made me forget where I am"; Creative thinking e.g., "playing sparked my imagination"; Activation e.g., "while playing I felt active"; Absence of negative affect e.g., "while playing I felt annoyed," Dominance e.g., "while playing the game I felt confident." Cronbach's alpha coefficient for this study was, respectively, 0.84, 0.89, 0.88, 0.77, 0.80, and 0.76.

### 3.3 Procedure

Data for this study were collected through a Google questionnaire consisting of sociodemographic variables (gender and age) and GAMEX escale. Students were informed about the purpose of the study. They were also informed about the voluntary nature of participation in the study, ensuring anonymity and referring to the data protection policy. The responsible researchers were present during its application to verify the correct completion of the questionnaire. The questionnaire took approximately 20 min to complete. Finally, the participants were thanked for their collaboration with this research. This study describes the design and implementation of two gamified experiences carried out with university students of Primary Education Teaching Degree at the University of Zaragoza in four groups of the subject General Didactics and Curriculum. Two two-hour sessions were used to develop both gamified experiences of approximately 40 min each.

TABLE 1 Descriptive analysis of the items of the GAMEX scale for the gamified experience digital board game.

	M	SD	Min	Max
<b>Fun</b>				
1. Playing was fun	4.22	0.96	1	5
2. I enjoyed playing	4.27	0.93	1	5
3. I had a lot of fun playing the game	4.10	1.05	1	5
4. My experience with the game was pleasant.	4.24	0.89	1	5
5. I think that playing is very entertaining.	4.24	0.90	1	5
6. I would play this game by myself, not only when asked to do so.	3.58	1.28	1	5
<b>Absorption</b>				
7. Playing made me forget where I am.	3.47	1.35	1	5
8. I forgot about my immediate surroundings while I was playing	3.44	1.34	1	5
9. After playing the game I felt like coming back to the “real world” after a trip.	3.21	1.37	1	5
10. Gaming “took me away from everything.”	3.24	1.38	1	5
11. While I was playing I was completely oblivious to everything around me.	3.32	1.34	1	5
12. While I was playing I lost track of time.	3.55	1.34	1	5
<b>Creative thinking</b>				
13. Playing awakened my imagination	3.70	1.22	1	5
14. While playing I felt creative.	3.69	1.22	1	5
15. While I was playing I felt I could explore things	3.46	1.31	1	5
16. While playing I felt adventurous.	3.37	1.34	1	5
<b>Activation</b>				
17. While playing I felt active.	3.86	1.16	1	5
18. While playing, I felt nervous.	2.84	1.38	1	5
19. While playing, I felt frantic.	2.90	1.40	1	5
20. While I was playing I felt excited.	3.61	1.22	1	5
<b>Absence of negative affect</b>				
21. While I was playing I felt annoyed.	1.81	1.17	1	5
22. While I was playing I felt hostile	1.91	1.21	1	5
23. While playing, I felt frustrated.	2.01	1.21	1	5
<b>Domain</b>				
24. While playing the game I felt dominant/I had the feeling of being in control.	2.48	1.26	1	5
25. While playing, I felt influential.	2.70	1.20	1	5
26. While playing I felt autonomous.	3.18	1.343	1	5
27. While playing the game I felt confident	3.6	1.22	1	5

M, mean; SD, standard deviation; Min, minimum; Max, maximum.

### 3.4 Data analysis

The SPSS Statistics 24.0 statistical package was used for data analysis processing. The study was carried out using a quantitative methodology. First, Cronbach's normality and alpha reliability indices were calculated for each variable studied. Second, descriptive analyses were performed for each of the items of the GAMEX scale for each gamified experience (Escape Room and digital board game). Finally, a mean contrast analysis was performed using Student's t statistic to observe the variability between the game dimensions (fun, absorption, creative thinking, activation,

absence of negative affect, mastery) for each of the gamified experiences.

## 4 Results

Next, we present the descriptive analysis data for both gamification experiences: digital board game (Table 1) and educational Escape Room (Table 2). First, as can be seen (Tables 1, 2), a first point of interest is that the means of all the items that make up each of the five game dimensions (fun, absorption, creative thinking, activation and mastery) are higher

TABLE 2 Descriptive analysis of the items of the GAMEX scale for the gamified educational Escape Room experience.

	M	SD	Min	Max
<b>Fun</b>				
1. Playing was fun	4.68	0.61	2	5
2. I enjoyed playing	4.68	0.70	1	5
3. I had a lot of fun playing the game	4.61	0.66	2	5
4. My experience with the game was pleasant.	4.57	0.59	3	5
5. I believe that playing is very entertaining.	4.76	0.48	3	5
6. I would play this game by myself, not only when asked to do so.	4.16	0.98	1	5
<b>Absorption</b>				
7. Playing made me forget where I am.	4.02	1.09	1	5
8. I forgot about my immediate surroundings while I was playing	4.05	1.08	1	5
9. After playing the game I felt like coming back to the “real world” after a trip.	3.68	1.18	1	5
10. Gaming “took me away from everything.”	3.80	1.18	1	5
11. While I was playing I was completely oblivious to everything around me.	3.81	1.10	1	5
12. While I was playing I lost track of time.	4.20	1.05	1	5
<b>Creative thinking</b>				
13. Playing awakened my imagination	4.33	0.83	2	5
14. While playing I felt creative.	4.34	0.82	2	5
15. While I was playing I felt I could explore things	4.26	0.88	1	5
16. While playing I felt adventurous.	4.23	0.95	1	5
<b>Activation</b>				
17. While playing I felt active.	4.52	0.69	2	5
18. While playing, I felt nervous.	3.79	1.15	1	5
19. While playing, I felt frantic.	3.68	1.04	1	5
20. While I was playing I felt excited.	4.25	0.87	2	5
<b>Absence of negative affect</b>				
21. While I was playing I felt annoyed.	1.91	1.20	1	5
22. While I was playing I felt hostile	2.15	1.25	1	5
23. While playing, I felt frustrated.	2.36	1.20	1	5
<b>Domain</b>				
24. While playing the game I felt dominant / I had the feeling of being in control.	2.79	1.22	1	5
25. While playing, I felt influential.	3.38	1.14	1	5
26. While playing I felt autonomous.	3.42	1.10	1	5
27. While playing the game I felt confident	3.94	0.88	2	5

M, mean; SD, standard deviation; Min, minimum; Max, maximum.

for the educational Escape Room experience. On the other hand, it is worth noting that the means of the items that make up the dimension “absence of negative affect” were higher for the Escape Room experience. It should be noted at this point that this factor actually measures “negative affect” through three items: While playing I felt annoyed; While playing I felt hostile; While playing I felt frustrated. This is why the participants indicated a higher level of annoyance, hostility and frustration during the educational Escape Room with respect to the gamification experience through a digital board game.

Secondly, the analysis of contrast of means by Student’s *t*-test (Table 3), reveals a significant variability in favor of the educational

Escape Room in the following game dimensions: fun ( $p < 0.01$ ), absorption ( $p < 0.01$ ), creative thinking ( $p < 0.01$ ), activation ( $p < 0.01$ ) and mastery ( $p < 0.01$ ). On the other hand, the absence of negative affect was significant ( $p < 0.05$ ) in favor of the digital board game.

## 5 Discussion

This study aimed to describe and compare two gamified experiences: an educational Escape Room and a digital goose board game through Genially implemented in the Higher Education

TABLE 3 Contrast analysis of game dimensions for both gamified experiences: educational Escape Room and digital board game.

	M (SD)		SE	t	95% CI
	Escape Room	Digital game			
Fun	27.47	24.66	3.08	6.30**	1.93/3.79
Absorption	23.56	20.22	5.08	6.48**	2.32/4.36
Creative thinking	17.16	14.22	5.38	7.71**	2.18/3.70
Activation	16.24	13.21	7.39	8.79**	2.34/3.70
Absence of negative affect*.	6.41	5.73	3.00	3.08*	0.24/1.12
Domain	13.53	11.92	4.68	4.85**	0.96/2.27

M (SD), mean and standard deviation; t, Student's t; SE, standard error; CI, confidence interval; \*\* $p < 0.01$ ; \* $p < 0.05$ .

\*The factor absence of negative affect actually measures negative affect (items): While playing I felt annoyed; While playing I felt hostile; While playing I felt frustrated.

classroom. Our results point out that the educational Escape Room is a powerful resource that induces and enhances fun, absorption, creative thinking, activation and a feeling of mastery in students. However, the data obtained confirm that the digital goose board game with Genially generated a lower level of negative affect (tension, annoyance, hostility and frustration) in the participants. Therefore, although the Escape Room is shown as a novel resource with great potential to promote the teaching- learning process, it should be noted that it is not free of negative effects. Likewise, it is convenient for the teacher to know the potential and characteristics of each of these recreational tools when implementing gamified experiences according to the didactic objectives and the desired classroom climate.

First, it should be noted that the Escape Room was presented as an innovative methodological strategy that generated a higher level of enjoyment, understood as the degree of enjoyment of the student with the gamified experience or activity (Parra-González et al., 2019). In line with what has been found in other previous studies, students reported a higher level of absorption or degree of evasion with respect to the surrounding environment (Högberg et al., 2019; González-Yubero et al., 2023), as well as a higher level of activation during the gamified experience (Navarro-Mateos and Pérez-López, 2022). In this line, our results show that the different challenges and enigmas of the Escape Room stimulated the students' attention and interest in the contents of the subject. Therefore, it could be said that the Escape Room is a tool that awakens students' curiosity, while favoring cognitive activation and absorption toward the task through fun as a learning formula (Pozo-Sánchez et al., 2022; Prieto-Andreu et al., 2022). This strategy methodology allows students to work in teams using their ingenuity, knowledge and personal skills to solve problems in a creative and collaborative way (Tudela et al., 2020).

Secondly, it should also be noted that the educational Escape Room had a greater effect in enhancing students' creative thinking and imagination in solving team challenges. Creative thinking is associated with a state described as flow (Csikszentmihalyi, 1990), in which the student is truly engaged in activities that produce pleasure without any promise of external reward. As confirmed in previous studies (Pozo Sánchez et al., 2020; González-Yubero et al., 2023), it could be said that the educational Escape Room is a powerful resource to enhance students' creative thinking and, with it, the satisfaction of learning new things and committing to academic goals. Similarly, the student body also reported a high

level of mastery or confidence during play through the Escape Room. Following Moore and Campbell (2021), an adequate game design contributes to the perception of mastery or personal control, thus favoring the degree of self-control over the learning process and increasing the motivational potential of students (Veldkamp et al., 2020). For this reason, it is always advisable for teachers to clearly specify the didactic objectives and present a motivating proposal through different learning situations. To this end, the puzzles and the narrative that surround the Escape Room should promote the development of feelings of control and efficacy with respect to personal capacity when facing team challenges.

Third, a noteworthy finding is that the educational Escape Room induced more negative affect (annoyance, frustration or hostility) than the digital goose board game with Genially. This finding is consistent with that obtained in the study by Soler et al. (2020), which confirmed that Escape Room games can induce a high level of stress in participants. Likewise, in the study by González-Yubero et al. (2023), it was found that the competitiveness generated by the Escape Room to leave the classroom in a time limit generated a high level of negative affect and demotivation that may depend on numerous factors, such as personal ability to manage emotions (González-Yubero et al., 2020), resilience capacity (Moke et al., 2018) or the magnitude of the final prize (Prieto-Andreu et al., 2022). It should be noted at this point that the digital goose game through Genially was an optimal didactic resource if the aim is to generate a more relaxed classroom climate, free of stress, frustration or annoyance on the part of the students. In this sense, board games through digital applications such as Genially were shown to be a calmer and less stressful gamification experience for the players, since there was no countdown, no confinement in the classroom, and no time limit for the game, as was the case in the educational Escape Room.

As detailed throughout this research there are significant differences in the dimensions of play enhanced through each of the two gamified experiences we implemented: educational Escape Room and digital goose game with Genially. Therefore, before implementing one or the other gamification strategy, it is advisable that teachers know the characteristics of each game. This will help when planning their teaching and learning activities, taking into account the classroom climate that can be generated by each of the resources applied. It should be noted that this study has some limitations. First of all, the gamification experiences were carried out in several groups of Primary Education Teaching Degree

students of the Faculty of Education of Zaragoza, so the study population is limited and belongs to a specific context. Likewise, the activities and tests designed for the gamification experiences we present could vary depending on the context and mode of implementation, producing a variation in each of the dimensions analyzed. Nevertheless, this research constitutes a novel experience that can help in the design of innovative gamification experiences in the university classroom.

## 6 Conclusion

In conclusion, this work provides additional empirical evidence that contributes to guide teachers in the design of gamified experiences through Escape Room and digital board games. As detailed throughout this research, the educational Escape Room is a resource with great potential to increase the motivation and meaningfulness of the teaching-learning processes as they promote fun, absorption, emotional activation and the perception of mastery while activating creative thinking and, therefore, the flow state as an effect. However, they are not without negative effects, generated by the game design and the tension involved in solving team challenges in a limited amount of time. It is at this point that teachers should provide resources to help students in the acquisition of key transversal skills such as emotional regulation to cope with the frustration generated by competitiveness during the game (González-Yubero et al., 2023). Finally, it could be said that both gamification experiences have facilitated the acquisition of the contents of the subject and the development of different skills related to teaching favoring the comprehensive training of students for their future professional work in the educational field. Therefore, this research encourages teachers to know, trust and carry out new innovative instructional practices.

## Data availability statement

The original contributions presented in this study are included in this article/supplementary material, further inquiries can be directed to the corresponding authors.

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## Ethics statement

The study was conducted in accordance with the Declaration of Helsinki and approved by the Research Ethics Committee of the Community of Aragon (CEICA) on 7 November 2022, ensuring its relevance based on the requirements of Law 14/2007 on biomedical research. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

## Author contributions

MM-M: Writing – original draft, Writing – review & editing. SG-Y: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. CF-L: Writing – review & editing. MC-M: Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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