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Gamification, collaborative learning and transversal competences: analysis of academic performance and students' perceptions

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Abstract

The importance and benefits of teamwork in the university context have been widely recognized in recent decades. However, there is little evidence that analyzes the effects of the combination of collaborative learning strategies and gamification methodologies for the improvement of transversal skills and academic performance. In this sense, in this study an intervention program was carried out in the university classroom that alternated the use of technology, gamification (through the use of the ClassDojo platform) and collaborative learning to improve the development of transversal skills. More specifically, the objective was to analyze the academic performance and qualitative perceptions of university students after the application of a gamified educational approach. A mixed research methodology was used with quantitative and qualitative techniques combining descriptive, correlational and linear regression analysis and an interview was administered to the 117 students involved in the experience. The results obtained indicated that the application of the program produced improvements on the development of transversal competences and on the academic performance of university students. In addition, the qualitative analysis of the perceptions allowed us to conclude that this program that combines gamification with collaborative learning received a positive evaluation by the students regarding different variables such as the applicability of gamification for the improvement of softskills, the benefits on the teaching–learning process and other factors that influence motivation before the use of gamification techniques in learning.

Keywords: Collaborative learning, Gamification, Transversal skills, Academic performance, Perceptions

Introduction

In the last century, society has witnessed dizzy changes that have influenced the education system and expects a different teaching design with suitable trained teachers to apply it. This need to update education methods entails a change in the conception of teaching–learning (T-L) processes, and requires advancing toward more innovative proposals. In line with all this, incorporating technology and gamification into university

classrooms has been an alternative to traditional strategies that has opened up new training avenues that facilitate the competences needed for the twenty-first century to be acquired (Bai et al., 2020; Subhash & Cudney, 2018).

Gamification is a learning technique insofar as students acquire and assimilate knowledge and competences by developing playful-formal participation strategies and dynamics. This methodological approach is based on games, esthetics and game thinking to engage people, motivate action, promote learning and solve problems (Kalogiannakis et al., 2021; Kapp, 2012). One of the main appealing features of gamified learning is the use of technology (Khaldi et al., 2023). Students are very familiar with these tools, and to such an extent that technological resources have become central elements of their daily activities and learning.

In the university context, employing games as a learning tool can be extremely useful because they help to deal with developing both specific and transversal competences from a more playful and existential perspective. Moreover, gamification implies redefining training processes and the student learning experience, but also contributes to create new education scenarios (Signori et al., 2018). This methodological strategy allows new proposals and more beneficial settings to be explored for Higher Education (HE) students, and it also avoids, among other matters, the T-L process becoming tedious or boring (Yunyongying, 2014).

Gamification generates a more interactive and stimulating learning environment, encourages cooperative learning and favors creating group work dynamics that improves the classroom environment (Hanus & Fox, 2015). With this gamified approach, complex competences can be dealt with from the playful perspective (Reyes et al., 2021), including creativity, problem solving, communication, collaboration and decision making (Moffat et al., 2015). Gamification stimulates other processes, such as critical thinking and creative problem solving, which are not easy competences to acquire by applying other methodologies. Basically, all these transversal competences, which can be acquired with gamified learning approaches, prove to be key components in university students' professional profile because they allow them to carry out professional roles and tasks that are expected in 21st-century society, and also in a global, changing and digital context (Hortigüela et al., 2018).

Integrating gamification processes into cooperative learning implies substantially improving students' socialization and generates a context that certainly favors the appearance of prosocial behaviors like collaboration (Asiri, 2019), commitment and empathy (Ruben-Moreno et al., 2019). All these conducts make up the essential elements of social competence. Likewise, when incorporating technology into game-based education formats, the digital competence is favored, which is extremely relevant for all teachers in today's technological era. We should not ignore the fact that the sudden appearance of the COVID-19 pandemic has revealed the importance and need for teachers to possess basic notions and technological skills, and they should be able to handle learning resources and contexts for which information technologies are explicitly used (Masry-Herzalah & Dor-Haim, 2021).

Apart from all this, the advantages of using gamification as a teaching strategy at university includes making overall improvements to learning (specifically more student participation), motivation, trust, attitude, perceived learning, performance and

commitment (Cerqueiro & Harrison, 2019; Subhash & Cudney, 2018). Different recent research works have provided positive results about using gamified techniques on university students' motivation (Alabbasi, 2017; Armstrong & Landers, 2018; Bicen & Kocakoyun, 2018; Buckley et al., 2017; Chu & Hung, 2015; Kostenius et al., 2018; Sanina et al., 2020). On this subject, certain authors (Apostol et al., 2013; Oliveira et al., 2022) maintain that gamification is able to encourage both extrinsic and instrinsic motivation, provided it entails overcoming challenges, awakening students' curiosity and allowing control capacity, and if it involves elements of fantasy. Other studies have confirmed improvements in academic performance, understood in numerical mark terms (Barokati et al., 2018; Domínguez et al., 2013; Marín et al., 2019). For all these reasons, gamification comes over as an interesting ally and an opportunity that can be applied as resources to motivate university students (Hanus & Fox, 2015) to acquire competences and to, consequently, improve their academic performance.

By taking into account all this background, the present study contemplated the objective of analyzing and knowing university students' perceptions and academic performance after applying an educational gamified approach. This experiment combined the adoption of technology and a learning methodology based on students' collaboration. This study attempted to answer these questions: do gamification dynamics contribute to develop transversal competences at university when set up as a cooperative learning format? To what extent does a relation exist that links the academic learning achieved by students individually in the subject on the whole, developing transversal competences and their working as cooperative team members? How do university students perceive this type of gamification experiments developed as cooperative learning formats being set up?

Research context and method

First an intervention program was designed. It was based on gamified dynamics and activities, and its purpose was to encourage university students to develop transversal competences. More specifically, this intervention was considered with the following specific objectives in mind: first, university students would manage the good working dynamics of their cooperative learning team's study and be capable of efficiently administering the different learning tasks contemplated inside and outside the classroom; second, and directly related to the first objective, the ClassDojo web/mobile application was used to encourage progress in and the development of transversal competences. Such competences (also known as *softskills*) refer to those skills that are considered important for occupying professional posts in 21st-century society (Gruzdev et al., 2018). Finally, the intervention was designed to improve each student's average mark (known as academic performance) when the program ended.

This program was developed by employing the ClassDojo tool. This is a virtual platform which can be accessed after previously registering to use it for free. ClassDojo is one of the most habitually employed technological tools in Primary and Secondary Education schools to manage the classroom climate and students' conducts (Manolev et al., 2019). In its present format, ClassDojo resembles a social networks platform based on a school (Williamson, 2017) and includes a function to model students' behavior by means of gamification. With this tool, a centralized digital network is offered to school

communities in which interactions take place among the members of these communities. In fact this tool has been classified as one of the 100 best sites and applications used in the education domain (Kapuler, 2013). The findings made by the study of Krach et al. (2017) indicate that, unlike other more traditional pen-and-paper methods, the ClassDojo tool produced more data and with more reliability. To all this, we add that ClassDojo is an efficient tool for developing collaborative activities from a creative perspective (Rivera, 2019). In the university context however, very few research works have been conducted with this digital tool (Manolev et al., 2019).

On university students' working dynamics and study, this intervention program was contemplated by taking a cooperative learning structure. By employing ClassDojo and teachers giving points, it allowed students to construct learning and to solve tasks and problems jointly. Points were given for teams to each transversal competence that had been set by reaching a consensus when the intervention program began: the team's union, leadership, engagement, attending face-to-face sessions, capacity to reflect, creativity, having initiative and taking attitudes of excellence. Among other matters, cooperative learning structures allow positive interdependence to be created among the same team members. In turn, this interdependence enables a sense of community and belonging to the university class to be built (Rivera, 2019; Skinner et al., 1996).

When the first semester of university academic year 2021–22 began, the teachers of the subject explained to the students how the ClassDojo application worked and provided the necessary instructions to use it. After downloading the application in their mobile devices, both students and teachers registered with the platform, and each student created his/her own avatar (each user's virtual identity to be represented in the web application). The points of transversal competences in the application were given to teams and were introduced. They were assigned the value of 1 point, except the "attitude of excellence" competence, which was assigned a value of 2 points. Broadly speaking, this system simulated what is known traditionally as "token economy". This is a psychological conduct modification technique based on operant conditioning principles. All these competences were operationalized to establish the most exact definition possible of its meaning and of the implications of each competence. Students could manifest individual initiative conducts, thanks to which their other team members could obtain reward points (depending on the competence type). One class session a month was used so that each team member could analyze and reflect on the points they had been given until that time and which transversal competences needed to be reinforced. The final reward that each team would receive when the intervention ended was decided according to the maximum number of points given in the ClassDojo application for the set of scored transversal competences. In this way, and according to the total points obtained by each team, every team member would obtain an extra proportional score that would be added to their final mark for the subject.

The phases of the intervention programme presented here cover all the aspects prior to the implementation of this programme. Therefore, once the students are familiar with and have access to the platform, the competences to be assessed and the points awarded for each one, as well as the final reward, have been established, it is time to implement and develop the intervention programme. To this end, a series of specific activities were proposed for each classroom session. All the tasks were designed according

to cooperative learning and points were awarded as a team, not individually. These are the activities and their schedule: Creation of concept maps on the contents of the subject (6 h distributed throughout the course); Viewing of a documentary on education and reflection on it (4 h); Design of a Didactic Unit (12 h); Poster competition on active methodologies (4 h); Design of an innovation and defence project (12 h); Creation of the Ideal Classroom (2 h); Reflection sessions on the evolution of the team and the competences to be reinforced (6 h distributed throughout the course).

On the other hand, the criteria for awarding points to each team are as follows: (1) *Link and union as a team*: this refers to the degree of cohesion and collaboration between team members. Support for others, effective communication and constructive conflict resolution are valued; (2) *Leadership capacity*: assesses the ability of one or more team members to guide and motivate others. The existence of positive leaders who favour the development of the team is valued by awarding leadership points; (3) *Engagement in learning:* refers to the dedication and responsibility with the content of the subject taught and the tasks assigned. Studying the concepts on a weekly basis, carrying out the proposed tasks… The team that brings the task completed or that correctly answers most of the questions on the content asked through interactive questionnaires earns commitment points; (4) *Attending classes*: measures the frequency with which team members attend the classroom. The attendance point is earned when more than half of the group attends the classroom; (5) *Capacity to reflect:* this is associated with the ability to analyse, understand and deepen the content of the subject, as well as the self-evaluation that the team carries out on its progress with the intention of identifying areas for improvement and proposing solutions to improve as a team; (6) *Creativity*: the ability to generate new, original and innovative ideas in the tasks set is considered. Points will be awarded to the teams that prove to be the most original and creative in the tasks set; (7) *Initiative*: this is measured on the basis of the proposals or ideas that come from the team members and allow the quality of the proposed tasks to be improved; (8) *Attitudes of excellence*: it values the willingness of students to share reflections on materials (books, films, documentaries…) that may be of interest to the whole class and prepare a presentation to explain the key aspects. Points could be awarded by the teacher in each class session. Figure 1 shows a summary of all these phases of the intervention program.

After applying the intervention experiment, a mixed research method was followed to be able to enrich and complement the findings obtained with other previous studies that adopted only quantitative strategies. Research was conducted in two phases: in the first one, quantitative data were collected and qualitative data were acquired in the second phase. All this allowed methodological triangulation from both perspectives and the used instruments.

Participants

Two samples of participants were involved in this study. The first one was made up of 117 university students from the university Primary Education Teacher Training Degree at a Spanish university (47.67% males; 52.33% females). Their mean age was 20.57 years and 76.27% of them came from an urban area. The previously described educational innovation experiment was carried out in a specific, but compulsory, first-course subject. In this subject, students received specific training in different ways to plan and

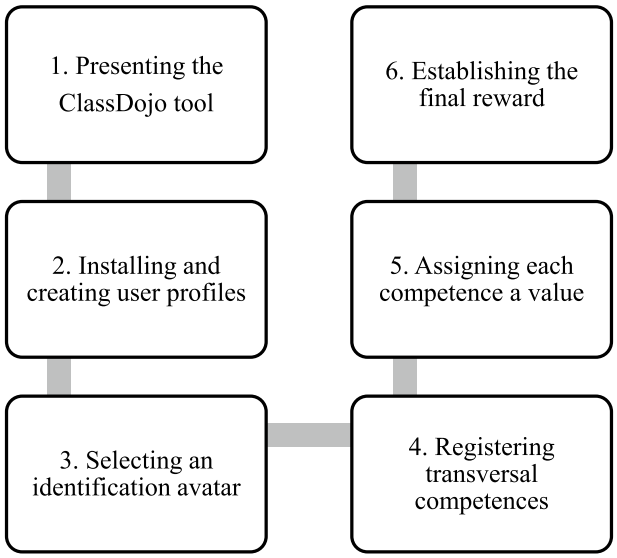

Fig. 1 Intervention program phases

evaluate the teacher's educational activities and students' learning activities, and also in undertaking curricular innovation projects.

The second sample comprised 15 university students (6 males, 9 females) who were involved in the educational innovation experiment. The selection of these participants was based on theoretical-intentional sampling in accordance with the following criteria: (1) students had to have participated in the intervention program about gamification and cooperation; (2) the sample had to be balanced as far as their age and gender were concerned; (3) the students' participation in this research phase had to be voluntary.

Instrument and data analysis

First of all, a digitized scale was used (1) with 11 Likert-type indicators (0–10) whose content referred to the degree to which the partipicipants agreed with the improvement and development of transversal competences thanks to using gamification strategies. The questionnaire was designed ad hoc because the transversal competences included in the ClassDojo application were proposed by the university students. The three last questionnaire indicators referred to general perceptions of using ClassDojo in a university classroom. The calculation of the scale's reliability index gave a Cronbach's alpha of 0.94.

For the variable of each student's academic performance, their final subject marks were taken as a reference (2), which included gamification experience. This mark corresponded to the summation of the mark obtained in the final exam, in undertaking an innovation project (practical task 1 of the subject) and when creating a didactic unit (practical task 2 of the subject).

When the intervention ended, the teachers of the subject gave an average mark (from 0 to 10), which derived from the points that each team had been scored in the ClassDojo application for all the the transversal competences included in it. This information was used as an indicator of the score obtained when each collaborative team developed transversal competences (3).

The university students followed a co-evaluation process (4), during which each team member (teams were formed by 4–6 members) had to score (from 0 to 10) the degree of their team-mates' work with cooperative dynamics related to respect, commitment, contribution, collaboration and responsibility. In this way, each student was given a mean mark that derived from the scores given by their cooperative team-mates.

In the second research phase, semistructured interviews were held (5) with the university students. These interviews were done in person in January 2022. Having performed an in-depth literature review, the questions to be used in interviews were designed according to these main theme blocks: (a) contributions of gamification to the T-L process in HE; (b) importance of gamification in learning; (c) previous experience with gamification processes; (d) the factors that influence motivation to use ClassDojo in learning; (e) applicability of the ClassDojo application in future professional work; (f) perceived risks of gamification in the T-L process; (g) ClassDojo's capacity to improve academic performance; (h) a ClassDojo evaluation to improve some transversal competences (social relationships and team cohesion, capacity to reflect, leadership, implication, creativity, initiative and attending face-to-face classes); (i) evaluation of the "point of excellence" of ClassDojo to improve good classroom environment; (j) system by which points are donated by teams.

To collect data in the first phase, the students in the first sample were sent an email with information about the study and were given the digitized scales. Data were collected in January 2022 and were stored in an anonymized spreadsheet. The interviews with the Sample 2 participants were also held in January 2022 (when the students who participated in the gamification experiment had finished the subjects of the first 4-montly period of the course). These interviews were held in person in the reference classroom where the subject sessions were carried out. Interviews were recorded after obtaining the participants' consent. They were transcribed by text processors. Each interview lasted 30–45 min.

Version 22.0 of the SPSS Statistical Package was used for the quantitative analyses in the first phase. The applied analysis techniques were descriptive (means (M) and standard deviations (SD) and inferential (bivariate correlations and linear regression analysis). The linear regression analysis was applied to analyze the predictive relation of the individual performance shown by each student in the subject, the mean mark obtained in the ClassDojo application (which evaluated the development of transversal competences) and, finally, the score that derived from the co-evaluation of all the cooperative team members.

For the qualitative phase, a discourse content analysis was performed (Mayring, 2019) by taking deductive categories from previous literature works (the specified criteria). The following were analyzed by three subprocesses: reducing (synthesis/procedure) data, presenting data and conclusions/verification. Applying different strategies improved methodological rigor (Ryan-Nicholls & Will, 2009): the sample selection criteria and the research context (dependence criterion) were described in detail; data used were transcribed to triangulate them later (credibility criterion); all kinds of relevant information were collected from the research by means of reports, especially data collection (confirming criterion).

Results

First of all, the results from the quantitative research phase are presented. Table 1 shows the descriptive statistics of the questionnaire about the perceptions of the ClassDojo tool to gamify the learning of transversal competences. In general terms, high mean scores were obtained for the set of evaluated competences. Leadership capacity (M = 7.14; SD = 2.63) and capacity to reflect (M = 7.28; SD = 2.26) were the competences with a lower score. Attitudes of excellence (M = 8.69; SD = 1.63) and engagement in learning (M = 8.52; SD = 1.63) were the two best scored competences by these students. Regarding general perceptions, these university students considered that the gamified system designed with ClassDojo had revitalized class sessions (M = 9.02; SD = 1.37), and their motivation and interest in the subject had increased (M = 9.15; SD = 1.25). In short, the students recommended using ClassDojo in HE contexts (M = 9.02; SD = 1.68).

Further analysis of the mean scores and distribution of the data reveals that although the means of the competencies and general perceptions are generally high, there are some important differences in the standard deviations. This indicates a considerable dispersion in some of the responses, suggesting that not all scores are concentrated around the mean value, and there may be students with significantly different perceptions. In this regard, the leadership ability of team leaders, team unity and cohesion, and the ability to reflect show a higher dispersion than the other competencies. This could indicate that some of the students who participated in the intervention evaluated these competencies much lower or higher compared to the majority of students. Thus, identifying this pattern in the data offers important information to understand the particular challenges faced by some students. Indeed, these outliers could be related to certain individual or contextual factors, such as personal characteristics or the dynamics of each team.

Tables 2 and 3 provide the correlational results. Significant positive relations appeared among all the transversal competences evaluated in the questionnaire. Likewise, the set of competences also correlated positively and significantly with the general ClassDojo evaluation as a tool to improve motivation and interest, and to revitalize class sessions. Significant correlations were observed between each students' academic performance in the subject and the score they were given in the ClassDojo

Table 1 Descriptive statistics of perceptions of the ClassDojo application

	M (0–10)	SD
Perceptions of improvement in competences		
C1. Attending classes	7.48	2.54
C2. Capacity to reflect	7.28	2.26
C3. Creativity	8.26	2.10
C4. Engagement in learning	8.52	1.63
C5. Initiative	8.39	1.86
C6. Team leaders' leadership capacity	7.14	2.63
C7. Link and union as a team	8.15	2.56
C8. Attitudes of excellence	8.69	1.63
General perceptions		
P1. Using ClassDojo has revitalized class sessions	9.02	1.37
P2. Using ClassDojo has increased our motivation and interest	9.15	1.25
P3. I recommend using ClassDojo at university	9.02	1.68

Table 2 Correlations among perceptions of competences

	C1	C2	C3	C4	C5	C6	C7	C8	P1	P2	P3
C1	1										
C2	0.75**	1									
C3	0.68**	0.84**	1								
C4	0.65**	0.70**	0.69**	1							
C5	0.64**	0.72**	0.70**	0.74**	1						
C6	0.55**	0.69**	0.58**	0.65**	0.68**	1					
C7	0.75**	0.66**	0.68**	0.65**	0.68**	0.68**	1				
C8	0.50**	0.66**	0.73**	0.62**	0.63**	0.49**	0.53**	1			
P1	0.61**	0.58**	0.65**	0.59**	0.63**	0.46**	0.69**	0.57**	1		
P2	0.47**	0.51**	0.56**	0.62**	0.59**	0.42**	0.49**	0.59**	0.72**	1	
P3	0.58**	0.59**	0.62**	0.68**	0.63**	0.51**	0.56**	0.60**	0.63**	0.81**	1

* The relation is significant at the 0.05 level. ** The relation is significant at the 0.01 level

Table 3 Correlations among performance, score for transversal competences and mark from the cooperative learning co-evaluation

	Performance	Transversal Competences	Co-evaluation
Performance	1		
Transversal Competences	0.51**	1	
Co-evaluation	0.47**	0.21*	1

* The relation is significant at the 0.05 level. ** The relation is significant at the 0.01 level

Table 4 Regression analysis to predict final academic performance

	Academic performance				
	Non standardized coefficients		Standardized coefficients		
Variable	B	Typ. error	B	t	Sig
(Constant)	−4.739	1.327		−3.570	0.001
Transversal competences	0.727	0.125	0.434	5.835	**0.000***
Co-evaluation	0.648	0.129	0.374	5.022	**0.000***

$R = 0.630$; $R^2 = 0.386$; $F = 37.51$; $*p < 0.000$

application for developing transversal competences ($r = 0.51$; $p < 0.01$). Academic performance was linked with the mark that each team member had obtained during the co-evaluation process ($r = 0.47$; $p < 0.01$). Finally, this mark from the cooperative learning co-evaluation was positively related to the mark obtained in ClassDojo for improvements in transversal competences ($r = 0.21$; $p < 0.05$).

Finally, a linear regression analysis was carried out to determine if the score obtained for developing competences with ClassDojo and the score from the co-evaluation could predict final academic performance in the subject. Both variables were included in the regression model to examine if they could represent part of the variance for academic performance. The results in Table 4 highlight 38.6% ($R^2 = 0.386$; $p < 0.000$), which jointly accounts for the variance for final academic performance. The analysis of the magnitudes of the direct effects of each variable with the β coefficients

showed that they were similar for both transversal competences ($\beta = 5.835$; $p < 0.000$) and co-evaluation ($\beta = 5.022$; $p < 0.000$).

The purpose of the qualitative research phase was to know experiences and to analyze in-depth the subjective perceptions and evaluations of our population of university students who were involved in a gamification and cooperation experiment to improve transversal competences. The included categories are specified in the instrument's epigraph and in the data analysis. Below the results follow the same order (a–j).

The first of the interview categories referred to the contributions that gamification made to the T-L process in HE (a). Here the subjects stressed that gamification promoted cooperation among group members, increased motivation and effort to learning, and helped learning sessions to be entertaining and fun. On the competitive aspect, the students mentioned that individual competitiveness reduced. However, they also highlighted that this competitiveness increased among teams. These dynamics were reinforced at all times by the high levels of motivation and effort that the team members made to cooperatively gain more points. One of the subjects described gamification as a necessary methodology in university classrooms. From this subject's point of view, this methodology allowed students to be more constant in their daily follow-up of the subject. All these considerations appear below:

Participant 3: "I think that it has contributed a lot to the union for both the group on the whole and individually"
Participant 6: "Above all what it has contributed to the learning process is a bit of fun"
Participant 7: "At school, they normally teach us boring rote learning by memory. So the university has surprised me by finally using methodologies like gamification to learn by playing. I mean, who doesn't like playing?"
Participant 9: "I think that it has reduced competitiveness in the classroom. By doing so, in a group it has promoted more cooperation, and it has contributed to all the team members making an attempt to search in a shared way for a benefit for everyone. So I think that it has favored more than competition, collaboration or cooperation among peers"
Participant 10: "It contributes more motivation because, in the end, you compete with your classmates to win. So it motivates you to make the effort".

On the importance of gamification in learning (b), the participants gave unaninmous responses. They stressed the relevance of this methodology in the academic process and for encouraging them to participate in class. Thanks to the creation of more personalized and motivating environments, the students believed that it enabled them to receive feedback of their actions and improvements in the learning process that was much more immediate. The responses provided below express all this:

Participant 4: "Yes, I think that it's because it's a new methodology. So it helps us to learn better because its helps us more to do things from one day to the next without leaving everything to the last minute".
Participant 6: "Yes, especially to avoid master classes and it manages to include us in preparing classes. So we participate more".

The third interview category corresponds to whether previous experiences existed or not (c) that the participants had acquired with gamification activities in their academic learning. On this, most of the participants admitted having experienced some education practices with the Kahoot application in some subjects, but only very sporadically and occasionally. However, none of the subjects had used the ClassDojo application before starting university. Consequently, this group of students lacked knowledge about gamification processes and educational innovation:

Participant 5: "No, but I´ve used Kahoot! I had that experience to sometimes revise, but not with ClassDojo, which I really liked. I think it's necessary".
Participant 14: Yes with Kahoot, which they used in some degree subjects, but only ocassionally".

When centering on the ClassDojo application, the following category aimed to highlight the factors which, according to the participants, influenced motivation to learn during the sessions held with this application (d). Their responses stressed interactivity or effort to gain points. They also positively valued the fact of being able to score such attitudes in university classrooms. This meant that these gamifying dynamics allowed students certain freedom and autonomy with their learning, as well as the capacity to choose (and to use points), which made learning a much more appealing context than that which they were used to. This came over in their testimonials below:

Participant 3: "I think that it's like a game because it's used to gain more points, and we can compete with other teams, and it helps us to engage more in studies, attending classes…".

Participant 9: *"You make more efforts to be given the reward".*

Participant 15: "Because the areas that are scored are evaluated in ClassdDjo, like engagement, attendance and such, I think that's the main point; you are rewarded for doing good things. That's why we liked it so much".

The applicability of ClassDojo in the future teaching profession was another of the questions in the interview (e). About this matter, the participants agreed to positively evaluate it being implemented into classrooms in the future when they will have to perform their profession as teachers. More specifically, their answers were based on encouraging fun, creativity, teamwork or participating in class, which they achieved with this tool:

Participant 8: "It favors creativity, companionship, empathy, and many matters related to participation in class".
Participant 14: "This kind of applications is very good for us, who will be future Primary Education teachers, because it helps us to feel more like going to college, feel more like learning and, above all, we enjoy ourselves, which is what matters".

Of the previously mentioned matters, emphasis was also placed on those risks that the teachers of the subject had to take as regards developing this innovation experiment with gamification in university classrooms (f). Different views about risks came over. Some students did not mention any risk with using this methodology, and others

stressed that group conflicts sometimes arose. Some subjects mentioned discontent with applying these more innovative strategies because they preferred other more conventional T-L methods:

> *Participant 8: "I think that those people whose nature is more traditional might reject this application, or might not show much interest in the subject. Especially those who encourage individualism might lose interest and not go to class".*
> *Participant 12: "Conflicts might arise in class, although that didn't actually happen".*
> *Participant 14: "I believe that everything has its risks because it's something new for us, and not understanding how it works or not agreeing with it giving points to a team for something that our team also did, led to some jealously being involved because another team gets more points than us. This might create competitiveness up to a point, which may mean conflicts"*

Another relevant question covered by the interview was about the capacity of the ClassDojo application to improve university students' academic performance (g). In general terms, the participants positively answered this question while the gamification and cooperation experience helped to increase their motivation, as well as the need to more actively follow up the subject's tasks to gain more points. From all this, it can be concluded that using game elements in this learning process improved this student group's level of knowledge and widened the range of university competences. All this is reflected in their answers:

> *Participant 1: "I think so because it helped us to study better and to spend more time studying. This means that we´ll find the exam easier, which will be better".*
> *Participant 3: "Yes, I think so, and it will have helped some more than others, but certainly all of us. I don't need much incentive to want to work and gain more points. But I think it helps, but I don't know to what extent, those people who study alone because it helps them to feel more motivated".*
> *Participant 10: "Thanks to these things, I've had to look at themes before to gain points in ClassDojo. Otherwise, I'd probably not have looked at them before".*

Another category considered during the interview referred to improving the transversal competences evaluated by the points system of the ClassDojo application (h). On this matter, the participants pointed out that using ClassDojo helped to improve the transversal competences being scored. Therefore, gamification proved to be an efficient tool to improve practical skills by stimulating students' autonomous learning and it adapted to the contents that were to be learned. More specifically, they emphasized some of these competences, such as creativity, leadership, attendance, engagement or teamwork. They also mentioned improvements in social relationships and team cohesion thanks to using this application. The subjects showed their agreement with their answers, as the following testimonials reflect:

> *Participant 8: "I think that leadership partly improved because, as we were always in a group, there was always someone who remembered the points that could be gained and how we could do that".*
> *Participant 10: "I think that what improved the most was creativity in groups, as well as attendance, because people began to attend more, so they got more involved".*

Participant 15: "I generally think that ClassDojo has been effective for us all, but particularly in teamwork, which is something that we, as future teachers, will need in our work"
Participant 2: "I think that, all in all, we must agree about this because we'll take it with us in our real life. One day in the future, we will sit in a teachers room with lots of people, and we´ll have to have coordination. So I believe that this learning will help us a lot in real life"
Participant 3: "As I see it, yes, completely. It encouraged relationships between members, and also with other teams. Relationships and competition were good".

The next category evaluated the "point of excellence" as a factor that had a repercussion on improving the classroom environment (i). When answering this question, the participants underlined that it was a very positively valued point because it allowed good attitudes to be recognized which, in other academic processes like exams of subjects, cannot be evaluated, which encouraged their motivation for this:

Participant 2: "The point of excellence made us want to go to class more and to study the subject more. On the other hand, it could lead to more rivalry and to do more things to gain a point, but not because we want to. I think that this point could be a double-edged sword".
Participant 4:" It's like the good team point, for the more powerful group. It's one of the most important and subjective points. It's a more transversal point and it encourages you to do things well in general".

The last of the intreview categories referred to agreeing or disagreeing with the system of donating points by teams (j). All the participants agreed with this decision, although some mentioned some risks that such dynamics might pose. Broadly speaking, these risks were related to how cooperative teams worked (ClassDojo points are given to teams and not to individuals). They also stressed that the sense of interdependence generated among cooperative team members built commitment to other people's success, and they were aware that the obtained benefits concerned all the members:

Participant 4: "As we all depend on one another, if someone fails, you also fail. So, although that's a nuisance, you can't blame anyone. This is great for communication, to talk about it and solve it. This helps the group to get to know its members better".
Participant 7: "I think that it's great as it is. What I´d try to do is to give the group more points, but for group members' individual actions, and not for the final product made by the group".
Participant 15: "I think so because it promotes teamwork. If points had been given individually, it could have generated more competitiveness among classmates".

Finally, an interesting issue to highlight concerns the link observed between the scores obtained in the initial perceptions questionnaire and the information collected through these interviews. In this sense, the variability observed in the scores of some competencies such as leadership capacity or team cohesion could be linked to the subjective experiences that students have shared in these interviews, especially in relation to the dynamics of cooperation and competitiveness between teams. As an example,

participant 8 commented that students with more traditional perceptions might reject this methodology, and participant 14 referred to competitiveness between teams, which could be related to this variability in the scores of leadership and team cohesion. Thus, certain students might have experienced conflicts or tensions that are reflected in the deviations observed. Along similar lines, this qualitative analysis also suggests that student motivation and commitment were high in general, but not all experienced it in the same way. In the interviews, some participants expressed frustration with the allocation of points between teams. This could have affected their perception of teamwork and cohesion, which is reflected in the low scores of some students in the competencies related to teamwork and cooperation.

Discussion and conclusions

The objective of this study lies in analyzing and knowing university students' perceptions after implementing a gamified approach in class. It also intends to evaluate this methodology's contribution to develop transversal competences, and how they influence students' academic performance. Accordingly, the first research question contemplated whether gamification contributes to develop transversal competences. The obtained findings (in both the data collected with questionnaires and the information offered by the participants during interviews) show significant relations between using these gamified strategies and how they contribute to develop transversal competences. According to the participants' testimonials, using ClassDojo is more effective in competences related to class attendance, creativity and engagement in the subject, and also in social relationships and cooperative groups' cohesion. In line with this, an agreement appears with the ideas proposed by the different authors (Buckley & Doyle, 2014; Sánchez-Martín et al., 2017), who consider that gamification favors creating collaborative and creative learning environments. Nonetheless, their use contributes to students having to make more effort in those attitudes that are evaluated in the studied application. It is worth highlighting the importance of using methodologies that defend developing the transversal competences needed for their professional future (Dochie et al., 2017; García-García et al., 2018). Some other relevant results evidence that using this methodology increases students' motivation for and interest in learning. This finding coincides with what previous studies put forward (Alsawaier, 2018; Gómez-Carrasco et al., 2019; Guillén-Guillamón et al., 2020; Hsua et al., 2018; Sousa & Rocha, 2019). Although the relationship between gamification and motivation has been documented, this study provides empirical evidence on how a point system such as ClassDojo can encourage not only active participation, but also individual responsibility for learning, an aspect that has been less explored in the literature.

The aim of the second research question is to analyze if a relation exists between using gamification and improving each individual's academic performance, developing transversal competences in all individuals, and how cooperative teams work after implementing the innovation experiment. The collected data analysis evidences a significant and positive relation between using gamification and improving the studied variables. The interviewed subjects' own perceptions support these results, and they coincide about its contribution to academic performance given the need to keep the subject up-to-date on a daily basis. They also stress the development of transversal competences, which

is motivated by the willingness to improve these competences because these attitudes have a repercussion on gaining the points that ClassDojo gives. About cooperative teamwork, all the participants coincide that it had reinforced their social relationships, they had all helped one another, and work group cohesion was greater (Ferriz-Valero et al., 2020; Sailer & Homner, 2020). While other studies have presented similar evidence, it is important to note that these results provide specific data on how gamification can influence social cohesion in educational settings. In particular, the experience of working in cooperative teams under a point system has allowed students to develop skills in leadership, conflict resolution and communication.

In light of the obtained results, it can be concluded that using gamification following a cooperative learning format in a university classroom positively contributes to improve these HE students' academic, social and personal development. Indeed similar results to those previously indicated by research were obtained (Rivera, 2019). The potential of this methodology is backed by the many benefits that it promotes for university students (Su & Cheng, 2015). Likewise, our findings emphasise that, during their initial training, future teachers need to know and experiment with different active and innovative methodologies that allow them to assess their applicability in the educational contexts in which they will develop their future professional work, given that the lack of training is a crucial factor for the successful implementation of gamified strategies. Finally throughout the present research, the combination of gamification experiences and cooperation is seen to be able to: encourage innovation processes at university; promote the development of transversal competences; favor continuing education to improve the T-L process; respond to 21st-century society's social and professional demands. This study therefore enriches the existing literature by demonstrating how gamification in a collaborative learning format can revitalise traditional methodologies and highlight the potential to transform learning in university settings.

Finally, it should be noted that while this work provides valuable insights into gamification in the classroom, there are several limitations that need to be considered. Firstly, the sample under study is limited to a particular population and context which may affect the generalisability of the results. Also, the subjective perception and previous gamification and cooperative learning experiences of the students may introduce biases. Prospective research in the field of gamification and collaborative learning is promising and suggests several directions to explore. Future research could focus on analysing long-term impact through longitudinal studies. Similarly, the comparison of different gamification platforms and collaborative learning methodologies could offer a broader understanding of best practices in the implementation of these strategies.

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Author contributions
All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Cecilia Latorre-Cosculluela, and Verónica Sierra-Sánchez. The first draft of the manuscript was written by Cecilia Latorre-Cosculluela, Verónica Sierra-Sánchez, and Sandra Vázquez-Toledo, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials
The data is available in the following repository:

https://drive.google.com/drive/folders/1SqdxqDV_w8TaVW4WOjHZQfUCq6nGRt2C?usp=sharing

Declarations

Competing interests
The authors declare that they have no conflict of interest.

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