Gamification and gaming proposals, teachers' perceptions and practices in Primary Education

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Abstract. This research has analyzed the application of gamification and game-based learning to primary education based on the evaluation of gamification by 308 primary education teachers in Spain. A quantitative and qualitative analysis was made of teachers' competences, the tools and devices most widely used, didactic functionality, emotional competence and social skills. The results showed that teachers had a positive attitude towards gamification, and good knowledge and management of tools such as Genially, Kahoot and Google Classroom. With the appropriate resources, class planning and teacher training, game-based learning and gamification can boost student motivation and commitment, and foster enthusiasm for beneficial, pedagogical interactive processes.

Keywords: game-based learning, primary education, gamification, teaching and learning strategies.

1 Introduction

Gamification is a didactic strategy that can complement the development of skills and capacities in formal and informal teaching. To achieve this, the training of future teachers should address this change right from the start, by developing educational activities based on the best strategies to foster the solid acquisition of teaching competences [1,2,3]. Several reports and studies have detailed the importance of gamification and gaming approaches in education. The NMC Horizon Report 2016 – K-12 Edition [4], and others in this series, identified these emerging technologies that could make a significant impact on learning and education, and promoted such educational innovations. Games and gamification as one of the relevant technologies for education were examined in particular detail in the 2012 report [5]. Gamification is

an emerging trend in education in reports and important frameworks [6], in which gamification is referred to as "the use of the mechanics of the game in contexts far removed from the game itself" [7], or to "the phenomenon of creating the experiences of the game" [8].

Gamification possesses the dynamics to create a significant experience that motivates students, by integrating gaming mechanics in non-gaming settings and applications. Game-based learning is the use of games to improve the learning experience while maintaining the balance between content, the games and their application to the real world [2]. These gaming proposals aim to resolve the problem of how to motivate students and boost their learning capacity. Research has focused on the influence of games on educational processes, and often points to statistically significant improvements in motivation and commitment [9,10,11,12,1314]. In the specific case of primary education, studies [3]; Uluyol and Sahin [15] have emphasized the improvement in motivation when gamification is applied in the classroom [16,17,18].

All these studies show the importance of gamification and gaming proposals in boosting motivation, commitment and enthusiasm in students. Gaming tools range from the basic and very mechanical, based on a simple rewards system and an efficient, attractive and interactive register with constant feedback; others promote interactivity, collaboration and innovative activities that apply technological resources that aim to provide a selection and sequence of content, with a methodology that keeps the student in interactive mode and maintains their attention with a fun element. When this difficult challenge is met by combining the demands of the curriculum with a methodology and resources that are attractive and entertaining, the results are normally beneficial, at least in terms of student commitment, enthusiasm, motivation and enjoyment. Some studies focus on the link between videogames and Mathematics [19,20], Sciences [21], cultural heritage [22] and Computing [23]. Serious games and gamification are trying to resolve the problem of motivating students and enhance their learning by using thinking and game-based techniques" [24]. The use of gamification and videogames in education provides a valuable stimulus to student learning in terms of knowledge, skills and attitudes in the various stages of the educational system, including primary and secondary education [25].

The popularity of gamification is evident across a range of fields such as business, marketing, finance, health, communication, entertainment and, of course, education. One of the basic proposals of gamification is to apply elements from game design to contexts in the real world, and increase student motivation and performance [26,27,28,29]. The study by Hursen & Bas [30] showed that students were satisfied with gamification apps, and confirmed that this strategy had led to better classroom communication between them and with their teachers; they signaled ClassDojo, designed especially for this purpose, as an app that helped them assimilate topics in Science more easily. Overall, the students found the apps enjoyable and interesting to work with.

Other recent studies [31] have found that students had a positive opinion of teaching programs based on gamification. The students stated they were happy to participate in such programs as they were fun, and a useful and positive learning experience that improved communication between classmates. However, difficulties can arise when there is a lack of teacher training, time and resources, or when these innovative

proposals do not fit well with the curriculum. Akkerman, Admiraal & Huizenga [32] and Moshirnia & Israel [33] agreed that integrating gaming proposals into Sciences classes requires more than just pasting text and images onto the games. These researchers emphasized the educational processes that increase learning in the classroom use games as a motivational element that enhances academic performance, making the best use of the combination of gaming and education to enable students to acquire skills to resolve problems.

2 Method

This analysis was based on data triangulation [34], and, to enhance the study's consistency and validity, the identical results obtained from the different items and analyses were accepted and interpreted with greater attention. This triangulation was carried out using a range of analyses and quantitative and qualitative data (open questions) that enabled us to obtain evidence to support the validity of the results and minimize error variance [35]. To achieve this, various dimensions were inserted into the questionnaire that were analyzed from a descriptive approach: (1) teachers' competences; (2) the tools and programs most widely used inside and outside the classroom; (3) the types of digital devices used; (4) didactic functionality; (5) emotional competence; (6) social skills. In addition, a text analysis approach to the open questions was used to examine the relations between two dimensions: (1) the resources recommended by the teachers for the best use of gamification; (2) the gamification devices used in relation to teacher and student competences, and the training the teacher had received.

A text network analysis methods based on these three dimensions have been developed for better comprehension on teachers and gamification processes [36], [37]. Retrieving the main topic from the open questions by identifying the clusters of co-occurrent words within them, based on the bag-of-words and skip-gram models [38,39,40]. For this purpose, we used the software "InfraNodus" written in JavaScript (Node.Js) implementing Sigma.Js, Cytoscape and Graphology libraries in the front-end and java-based Neo4J graph database. This software uses graph theory instead of probability distribution to identify the related words and assign them into topical clusters. First, all the words in the text are converted into their lemmas to reduce redundancy; keeping the morphological root of each word. The words that function as liaisons and that do not carry any additional meaning are removed from the text. The text is then converted into a directed network graph. The normalized words (lemmas) are the nodes in the network graph and their co-occurrences are the edges. This application of graph theory helps gain a better understanding of the textual discourse structure of the relationships between "gamification" and "education", identifying the sematic structure of the relationships among the results. Furthermore, the method of pairwise comparisons was implemented to focus on the summarization of shared or unshared topics among document groups [41]. The comparison criterion is established according to the following formula:

$$D_1^C \in D^C \quad (1)$$

where index $I \in \{1 \ldots |DC|\}$ we define DC by topics discovered using latent Dirichlet allocation or LDA (Blei, Andrew, & Jordan, 2003) and a pairwise distance matrix. Finally, we calculated tf-idf of bigrams.

2.1 Instrument

Firstly, in academic year 2020/21, a questionnaire was designed and validated using the Delphi technique and the expert knowledge coefficient, and then registered with Spain's Patent and Trademark Office (number: M4150516, name: GAUBI-PRO. The questionnaire formed part of the research project "Gamification and ubiquitous learning in primary education. Elaboration of a map of competences and teaching, student and parent resources (GAUBI)" (RTI2018-099764-B-100). This instrument was later tested for reliability using the Bartlett test of sphericity and the KMO test for sample adequacy (Table 1).

Table 1. KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.891
Bartlett's Test of Sphericity	Approx. Chi-Square	2876.912
	df	35
	Sig.	.000

The Bartlett test's significance score ($p<0.05$) indicated that our matrix differed from the matrix unit with a confidence level of 95%, thus, there were significant correlations between the variables to indicate the possible existence of latent variables. The KMO test presented a value close to 1 (0.891), thus, the partial correlations of our variables were minor. The Cronbach alpha score was 0.889.

2.2 Participants

The study population consisted of primary school teachers in the Spanish education system. The sample, which was non-probabilistic and intentional, was formed of 308 teachers who responded to the online questionnaire delivered to educational centers across Spain. The group was 74.2% women and 25.8 men, which made for a sample that was representative of the gender disparity in this profession. The mean age of the subjects was 41.46 years, with a mean of 15.9 years' teaching experience. The sample was considered to be representative, given its size, age and gender distribution. The sample size was assumed to be normal, as confirmed by the Kolmogorov Smirnov test result.

The sample subjects were drawn from state schools (78.6%), state-supported private schools (15.3%) and private schools (6.1%), a proportion that broadly reflects student representation in education in Spain. It was noteworthy that 67.9% of those surveyed

were already participating in ICT projects at their schools, which demonstrates the interest of the subjects in their own learning and skills improvement. The other 32.1% stated they were not involved in any ICT project. Another interesting fact was that 52.1% of the subjects were satisfied that the technological resources available to them at their centers, 31.5% believed they could be improved, and 16.2% stated that their digital resources were insufficient.

3 Results

3.1 Descriptive analysis

The analysis of Dimension 1, "Teachers' Competences", showed (Table 2) that the majority of the teachers were positive in this respect, especially for item 1.2 that referred to communication and collaboration with other professionals using technological resources (65.3%), they were also positive on their management of technological resources (item 1.1), at 61.9%. Almost half the subjects (53.3%) declared they were capable of resolving technological problems (item 1.4) and of applying gamification-based activities in the classroom (item 1.5) (50.3%). Less than half the subjects stated that they created their own digital content (item 1.4); this item received the fewest positive responses.

Table 2. Dimensions and items, descriptive analysis. Values 1= Totally disagree, 2= Disagree, 3=Medium, 4= Agree, 5= Totally agree

	Items	1	2	3	4	5
1	1. Control of tools and technological resources.	0	2.9	35.4	**43.4**	**18.5**
	2. Communication and collaboration with other professionals using technological resources.	0	7.5	27.3	**38**	**27.3**
	3. Creating digital content in their regular practice of teaching.	6.8	19.8	27.6	**32.1**	13.6
	4. Capable of solving problems in different pedagogical situations through technology.	2.3	14	30.5	**39.9**	**13.3**
	5. Capable of applying gamification-based activities in the classroom.	5.8	15.3	28.6	**38.3**	**12**
2	1. A game-based learning approach for training future teachers.	6.2	7.5	14.3	**37**	**35.1**
	2. It is important to work in immersive environments in the early stages of teacher training at university.	5.2	5.5	10.7	**36.4**	**42.2**
	3. Working with interactive 3D gaming environments is beneficial in the early stages of teacher training.	4.2	14.3	27.6	**38.3**	**15.3**
	4. I worked with gamification-based apps in my teacher training at university.	**67.5**	**14.9**	10.7	3.9	2.9
	5. I consider that continuous teacher training in digital competence in gamification is necessary.	1.9	1	9.7	**29.9**	**57.5**
	6. I have received training in digital competence.	4.2	9.7	24	**41.2**	20.8
3	1. I use programs such as Kahoot, Socrative, Plickers, or similar, to assess my students.	32.8	10.1	13.6	25.3	18.2
	2. I use programs such as Minecraft or Scratch in my classes.	**69.5**	**15.6**	6.5	6.5	1.9
	3. I use digital storytelling programs or apps.	**49**	**14.9**	16.2	15.3	4.5
	4. I use augmented or virtual reality programs or apps.	**49.7**	**15.3**	20.8	12.1	2
	5. I use flashcard or study unit apps with programs like Quizlet, or similar.	**39.6**	**16.2**	17.9	12	14.3

	6. I use a platform or educational videogames such as Classcraft, or similar.	**51.3**	**18.5**	15.6	8.4	5.9
	7. I use programs such as ClassDojo, Edmodo, or similar, to interact with students and families.	**41.6**	**13**	11.7	16.9	16.9
4	1. The games linked to learning activities foment collaborative learning.		5.5	16.2	**33.1**	**43.2**
	2. The applicability of gamification in the classroom depends on the level of the teacher's digital competence.	0.6	3.9	11.7	**36**	**45.1**
	3. I consider that the use of gamification improves learning outcomes.	3.2	5.5	17.9	**45.8**	**26.6**
	4. The applicability of gamification in the classroom depends on the resources available.	3.6	5.2	18.8	**35.7**	**37.3**
	5. I consider that the use of gamification is innovative in education.	2.9	5.2	11.7	**37.7**	**40.6**
	6. The applicability of gamification in the classroom depends on the teacher's positive attitude.	3.9	0.6	9.1	**29.2**	**59.1**
	7. A proper use of gamification in the classroom requires substantial preparation time.	1.9	2.9	11.4	**32.9**	**51.8**
5	1. The social atmosphere of the classroom improves with the use of gamification.	1	4.9	23.4	**34.1**	**34.1**
	2. Gamification motivates students more than the more traditional learning activities.	3.6	2.6	11	**21.4**	**63.3**
	3. Gamification helps students to acquire social competences.	1.6	8.1	19.2	**32.8**	**36.4**
	4. Gamification can reveal potential socio-affective problems in students.	3.6	8.1	28.6	**36.4**	**22.1**
	5. Gamification can foment an atmosphere of unhealthy competition among students.	4.9	1.6	21.8	**40.3**	**35.7**

In Dimension 2, "Tools and programs most widely used inside and outside the classroom", items 2.1 and 2.2 yielded scores above 70% among the teachers who considered that game-based learning was essential to their training, as is the use of immersive environments in the early stages of teacher training at university. Continuous learning in digital competence in gamification for teachers was also deemed essential (item 2.5), as a high positive score of 87.4% testified. These high scores emphasized the importance of gamification in teacher training, however, item 2.4 revealed a shortfall in such instruction in the early stages of teacher training at university (6.8%), which indicated a lack of activities and learning in gamification that the subjects considered to be essential. That said, the majority (62%) recognized that they had received training in digital competence (item 2.6). In Dimension 3, "Types of digital devices used", Figure 1 reveals a generally low level of use of gaming apps, in particular Minecraft, Scratch, VR or Classcraft, with no more than 15% usage (items 3.2, 3.4, 3.6); there was slightly greater usage of StoryTelling, at 20% (item 3.3). Teachers tended to make greater use of apps such as ClassDojo, Edmodo, Flashcards and Quizlet (items 3.5, 3.7) at around 30%. The most widely used apps were Kahoot and Socrative, at 43.5% (item 3.1). Furthermore, Figure 1 shows the type of devices used for the developing of gamification activities.

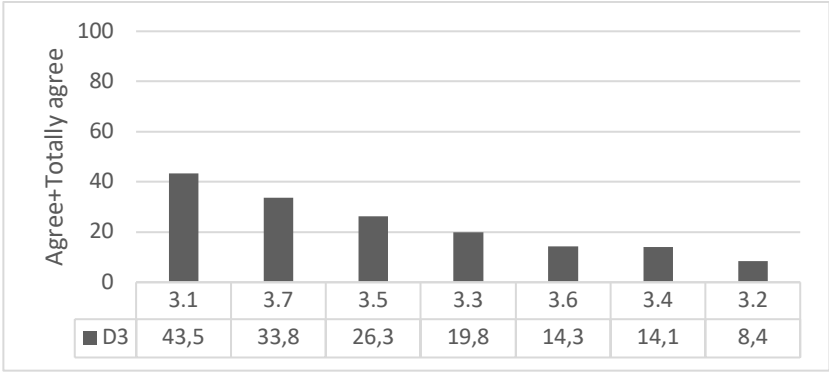

Fig. 1. Dimension 3. Type of devices used. Values 4= Agree + 5= Totally agree.

In Dimension 4, "Didactic functionality", teachers clearly stated that gaming proposals encouraged collaborative learning (item 4.1), with a highly positive score of around 75%; the sample considered that learning through gamification helped to improve results (item 4.3). Certain factors are considered essential in this sense, such as the level of the teacher's digital competence (item 4.2), availability of resources (item 4.4) and time to prepare game-based activities (item 4.7), with values of around 80% (Figure 2). Almost 80% of those surveyed considered that gamification was an innovation in education (item 4.5), and that the applicability of gamification depended on the positive attitude of the teacher (item 4.6), which scored a near unanimous 90%.

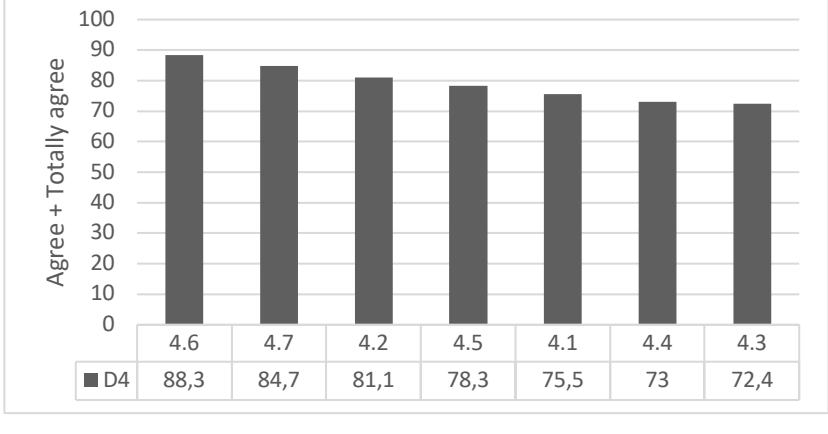

Fig. 2. Dimension 4. Didactic functionality. Values 4= Agree + 5= Totally agree.

In Dimension 5, "Emotional competence and social skills", it was observed that gamification motivated students more than in traditional classroom activities (item 5.2), as was confirmed by 86% of the teachers. The social atmosphere in the classroom and the acquisition of social competences (items 5.1, 5.3) were also seen to have been

improved, with teachers' scores of close to 70%; potential socio-affective problems in students arising from game-based activities was indicated by about 60% of teachers (item 5.4). An interesting finding was the fact that gamification could foster an atmosphere of over-enthusiastic competition (item 5.5), as observed in positive values of close to 76%, confirming that games in the classroom stimulated a potentially problematic competitive edge.

3.2 Qualitative analysis: Open questions

The instrument used in the survey was a mixed questionnaire with open questions that enabled participants to respond freely. The frequencies in the responses were numbered and counted for each question posed, to provide the elements and factors of interest for this study, which strengthened and reaffirmed the values obtained in the quantitative and descriptive analyses. To the question "Which learning apps can the students use at home?" the Genially app was the most highly rated by the teachers for its attractive layout and considerable versatility. Kahoot was also highly rated, as enabling feedback through questions and answers in gaming mode. High frequencies were also registered for Google Classroom for its robust, attractive and useful setting. Fewer frequencies, though by no means inconsiderable, were recorded for apps such as ClassDojo, Padlet, Canva, Wordwall, Socrative and Quizizz (Figure 3).

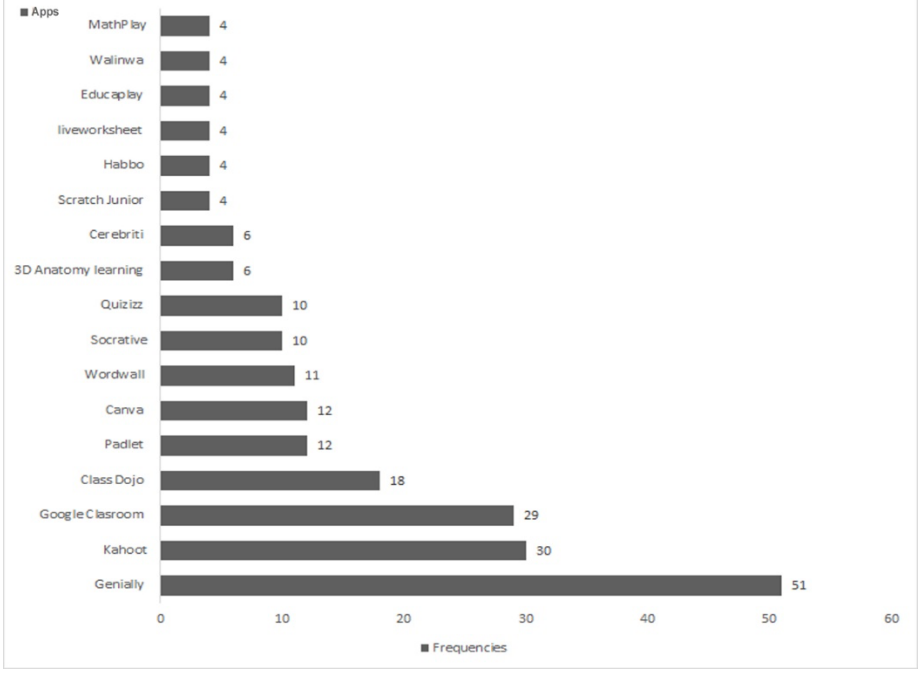

Fig. 3. DAB8: "What educational apps can your students use at home?

To the open question "Indicate the areas in which gaming and gamification can have maximum educational applicability", the teachers said that Natural and Social Sciences were the most appropriate areas where gamification could best be integrated. Evidently, attractive content with images, sound and video, with the potential for students to experiment within a range of activities makes this methodology easy to apply in the Sciences. However, a high number of frequencies were reported for gamification in languages and Mathematics. There were fewer frequencies for applying gamification to Physical Education, possibly due to the organization of space required to carry out tasks in this subject; nevertheless, the numbers were still high, indicating that teachers did not entirely rule out using digital games in this field (Figure 4).

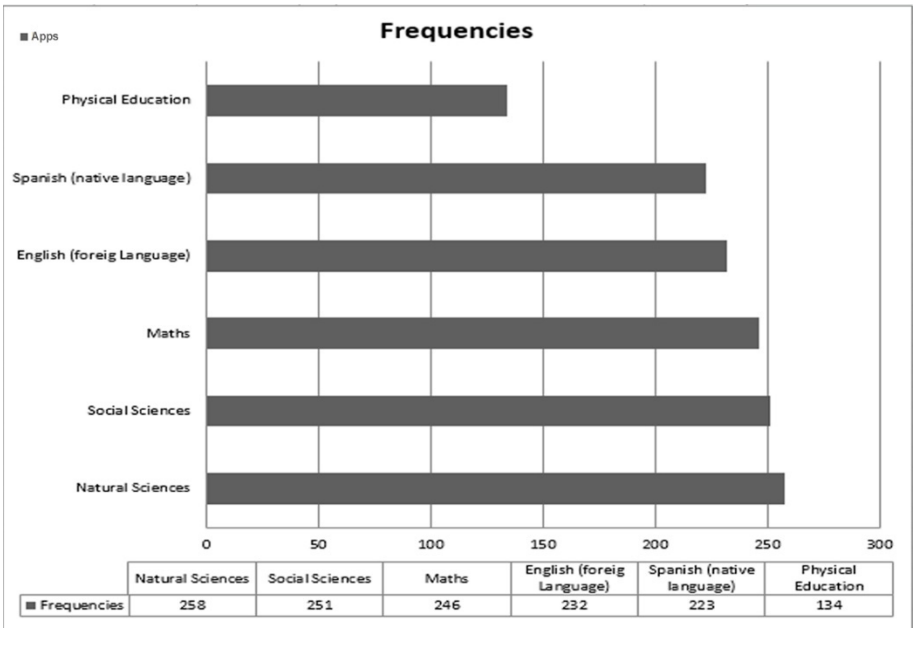

Fig. 4. Point out the areas in which games and gamification can have a greater educational applicability.

3.3 Reticular analysis

The responses to the open questions were analyzed to establish links between two dimensions: (1) the resources recommended by the teachers to favor gamification (green nodes); (2) the devices used in gamification (orange and pink nodes) and their link to teacher and student competences, and to teacher training (Figure 5).

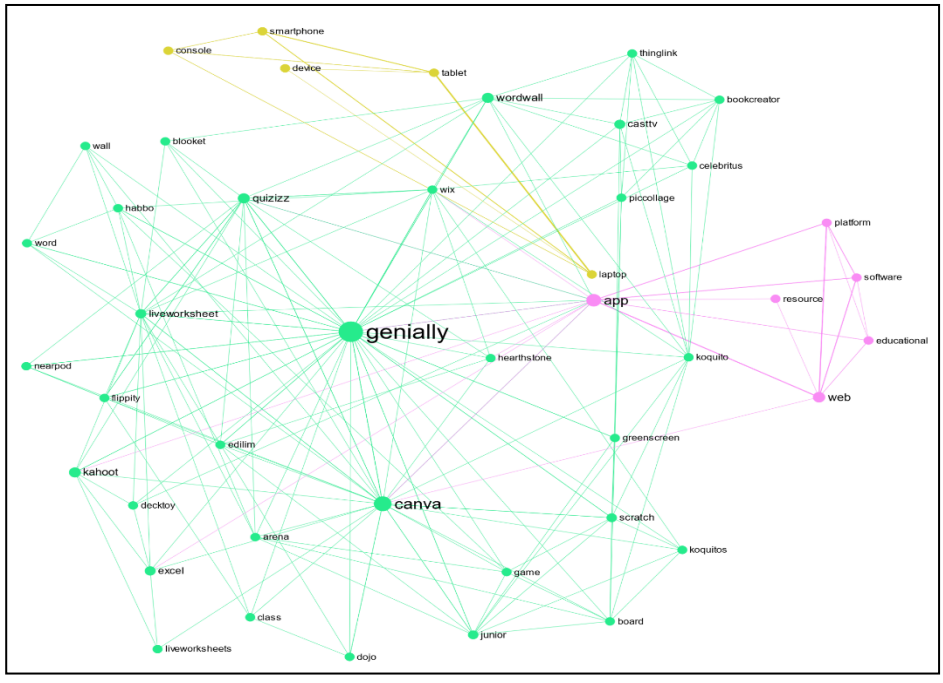

Fig. 5. Graph of open questions (resources and devices).

The degree centrality that connects the vertices of the words to most content centers most strongly on “genialy”, “canva” and “app-web”, with a degree centrality higher than 0.05, and high conductivity (genialy 41.9 / canva 21.1 / app 22.7 / web 22.9). The higher is the network's structure diversity and the higher is the alpha in the influence propagation score, the higher is its mind-viral immunity — that is, such network will be more resilient and adaptive than a less diverse one. In case of a discourse network, high mind-viral immunity means that the text proposes multiple points of view and propagates its influence using both highly influential concepts and smaller, secondary topics. The mind-viral immunity is medium and the structure focused (Table 3).

Table 3. Network's structure diversity.

Topics	Nodes in Top Topic	Components	Nodes in Top Comp
3	75 %	2	89 %
Nodes	Av Degree	Density	Weighed Betweenness
44	3.82	0.089	0.036646

We plot the narrative as a time series of influence (using the words' betweenness score). We then apply detrended fluctuation analysis to identify fractality of this time series, plotting the log2 scales (x) to the log2 of accumulated fluctuations (y). Using the alpha exponent of the fit (which is closely related to Hurst exponent)), we can better understand the nature of this relation: uniform (pulsating | alpha <= 0.65), variable (stationary, has long-term correlations | 0.65 < alpha <= 0.85), fractal (adaptive | 0.85 < alpha < 1.15), and complex (non-stationary | alpha >= 1.15). The results show a ks: 0.88, d: 0.31 <= cr: 0.48 scale-free network (based on Kolmogorov-Smirnov test). As the value d is below the critical value cr it is a sign that both distributions are similar. (Figure 6).

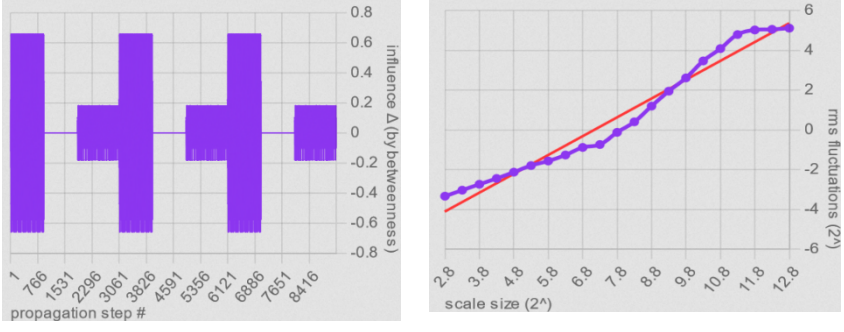

Fig. 6. Graph fluctuation analysis.

Likewise, to complement the cluster information, we analyzed the bigrams associated with each of the clusters in order to go further into the relationships between concepts and their impact on learning. To do this, we used the following notation.

```
bigram_tf_idf <- bigrams_united %>%
  count(cluster, bigram) %>%
  bind_tf_idf(bigram, cluster, n) %>%
  arrange(desc(tf_idf))
```

We present, in Table 4, the "td_idf" with the highest results of the three most representative bigrams in each of the clusters in order to determine their educational functionality and implications.

Table 4. Data of cluster.

Cluster	bigram	n	tf	tf_idf
Teachers' competences	teaching-gamification	21	0.01984481	0.04249422
	interact-technologies	33	0.01864482	0.02849211
	create-digital content	24	0.02684118	0.04241460
Students' competences	gamification-creative skills	43	0.02612241	0.04129641
	gamification-collaborative work	51	0.02984499	0.04249464

	gamification-communication-interaction	37	0.02046901	0.04124662
Initial and Continuous Training	foster-in service-training	48	0.02240641	0.02086241
	guarantee-training	35	0.02882462	0.04966412
	university-lack of training	33	0.02664289	0.04129866

In Table 4, we can observe that the first cluster "Teachers' competences" is divided in three bigrams: (1) "teaching-gamification" (tf_idf 0.04249422); (2) "interact-technologies" (tf_idf 0.02849211) and (3) "create-digital content" (tf_idf 0.04241460). In this sense, the teachers' competence in relation to the use of gamification in and outside the classrooms could help to develop students' motivation by improving the sense of enhancing innovation in the classrooms. Teachers feel confident in the interaction with other teachers and students through digital devices, but they do not create different digital content for the development of the curriculum in their subjects. The second cluster "Students' competences" is divided in three bigrams: (1) "gamification-creative skills" (tf_idf 0.04249464); (2) "gamification-collaborative work" (tf_idf 0.04249464) and (3) "gamification-communication-interaction" (tf_idf 0.04124662). Teachers perceive that students' competence can be enhanced with the use of gamification. In this sense, the implementation of gamified activities could contribute to develop creative skills, a more dynamic collaborative work in and outside the classrooms and to foster the interaction and communication processes among the students. Finally, the third cluster "Initial and Continuous Training" is divided in another three bigrams: (1) "foster-in service-training" (tf_idf 0.02086241); (2) "guarantee-training" (tf_idf 0.04966412) and (3) "university-lack of training" (tf_idf 0.04129866). Implementing gamified activities requires that in the process of initial teacher training, as well as in their subsequent professional development, universities and educational administrations provide adequate and adequate teacher training in line with the requirements in digital teaching skills established in the regulatory frameworks of each country.

4 Discussion

Various studies have analyzed the use of game- and gamification-based learning in educational contexts, and presented positive results similar to those obtained in our study [10,2,42,11,12,13,43,14,44], particularly in the improvement in interaction, motivation, enthusiasm and fun felt by students when involved in these pedagogical designs. A data triangulation of the results showed in a structured way how primary education teachers possessed the teaching competences that enable them to manage tools and technological resources, particularly in collaboration with other teachers, however, the teachers surveyed did not usually create specific digital content adapted to the curricular content and competences of their area of teaching. This lack of training in gamified content needs to improve in order to provide students with adequate study plans with gamified elements, by defining learning objectives that contain various degrees of difficulty, and by creating content adapted to the students' level and potential

to allow them to choose from a range of different learning paths [45]. For this to happen, a national education plan is needed to boost teacher training in digital competences. Although the teachers did not normally create their own content, the results of this study showed that teachers are capable of solving problems and undertaking gamified activities in the classroom. The study also showed that teachers were fully aware of a range of digital tools and know how to use and apply them in the classroom. In this context, and with these data, we believe in the need to bolster early-stage teaching training at university, even to the extent of integrating gaming strategies in the curriculum, as other studies have suggested [46,10,44].

Meanwhile, it is important to continue with game-based learning and the use of immersive environments in early-stage teacher training at university, as a vital part of teachers' continuous learning process. This lack of gamification training indicated by the teachers is a variable that stands against gamification, and has been detected as essential especially in early teacher training stages [47,48,49,50]. Although this shortfall in training is gradually being addressed through continuous learning activities developed by education authorities, as indicated in the training received in digital competence (item 2.6), there is still a lack of training at university for future teachers in terms of gamification as an emerging technology and methodology (item 2.4). Hence the importance of action and improvement to overcome these shortfalls in the early stages of teaching training at university, relating this training to the development of transversal generic competences in higher education in line with the regulatory frameworks of digital competence [47,51,52]. The most widely used and successful tools in the opinion of the teachers were Kahoot, Genially, Google Classroom Kahoot and ClassDojo, although their use is by no means generalized, as the data for Dimension 3 showed. Nevertheless, the study revealed an appreciable effort by at least one third of the teachers surveyed to know and learn how to operate these tools in order to implement them adequately in class. To a lesser extent, the teachers used tools such as Padlet, Canva, Wordwall, Socrative and Quizizz, which recent studies have been identified as being popular among teachers of pre-university level students [53,54,55].

The study showed the teachers' very high positive attitudes towards gamification and its didactic functionality, as benefiting collaborative approaches and fostering innovation in education. The essential factors for successful use of gamification center on the availability of resources and time to integrate it in classroom activities, and a positive attitude on the part of teachers. The teachers considered that the Natural and Social Sciences were the subjects best placed to integrate gamification although game-based activities can equally be adapted to Mathematics and Physics [56], languages [57] and Physical Education classes [58].

The social atmosphere in the classroom and students' social competences were also seen to improve with gamification, according to the teachers, the only drawback being the potential for over-enthusiastic competition. However, the overall conclusion drawn from the study is that the teachers insisted that gamification motivated the students more than the traditional classroom activities, in line with other studies [10,11,59] that also highlighted the importance of greater student engagement thanks to game-based activities. Despite that, we agree with Eseryel [42] who stated that the motivation aroused by gamification must be closely tied to curricular content and pedagogical proposals in order to be properly integrated in the classroom.

5 Conclusion

As stated by Cózar & Sáez [2], when resources, class planning and early-stage and continuous teacher training are all in place, game-based learning through tools and / or immersive environments can deliver benefits and advantages centered on pedagogies that enable the student to be active and protagonist in their learning. Student motivation and commitment are strengthened by these approaches, with potential benefits in socially integrative behavior. Game-based activities can give rise to unhealthy competition in the classroom, which teachers must learn to control, yet the relative advantages of gamification in greater student enthusiasm, participation and commitment can foster interesting and beneficial pedagogical processes. This study has shown that training at university for future teachers in this emerging methodology is deficient. Studies and international reports increasingly indicate that these key trends will be adopted sooner rather than later, and will bring about change in practices in learning contexts. University education and early-stage teacher training in higher education must rise to these challenges and the demands of today's society by taking full account of these emerging trends that future teaching professionals will have to manage in their immediate futures [2]. Now is the time for educational technology to drive elementary education with interactive gaming proposals, and it is encouraging to see the efforts of teachers to know, to learn how to use and apply these resources and methodologies in the classroom, although there is still room for considerable improvement in continuous training and early-stage teacher training in game-based activities. Society and teaching professionals are gearing up for this change, and we hope to be able to report on advances in this field in future studies.

Acknowledgments. This research has been developed with the support of the I+D+I Project entitled: ''Gamification and ubiquitous learning in Primary Education. Development of a map of teaching, learning and parental competences and resources "GAUBI". (RTI2018-099764-B-100) (MICINN/FEDER) financed by FEDER (European Regional Development Fund) and Ministry of Science, Innovation and Universities of Spain.

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