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What Perception Do Students Have About the Gamification Elements?

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ABSTRACT The use of the mechanics and elements of games in non-ludic environments (Gamification) has increased in non-ludic contexts in various areas including education. This study focused on the perception that students have of the different elements of gamification in three different experiences, after which students were asked to answer a survey about the gamified elements of the course in which they participated. In the three experiences, Feedback, levels, points and missions stand out as the best valued, despite the fact that, for example, “time limit” were little valued by the students, it can be useful in the design of a gamified experience, but its use must be well regulated to avoid possible negative aspects and favor a good experience for the student. On the other hand, though badges were also been well valued by students in the longest experiences, in the shortest experience, it was one of the worst rated elements. Finally, the elements that students liked the least of all those analyzed, were the leaderboard and the blocked content.

INDEX TERMS Gamification, gamification elements, higher education.

I. INTRODUCTION

Nowadays, new generations of students learn differently [1] and prefer to learn information that is useful, fun, and relevant [2]. Knowing how this generation can learn better, and what their preferred learning styles are [3], has become a new educational problem [4].

The education industry has had to be redesigned and adapted based on the needs, preferences and orientations of digital natives, to be successful in the 21st century [5]. The lack of student participation in the educational environment [6] and the lack of motivation of students to learn [7] became a fundamental problem in modern education as a result of the digital revolution [8].

It is in these problems that gamification can help us. Gamification is characterized by the incorporation of elements of the game in a context not related to the game [9]. The term describes characteristics designed to support and motivate the performance of the task [10] establishing joyous experiences and increasing participation in specific activities. In recent years, it has been used in different areas such as cartography [11], machine learning [12], software

development [13], marketing [14], health and medical problems [15], tourism [16] or education [17].

Recently, [18] pointed out that gamification research is maturing from the fundamental questions of “what?” and “why?”, to be interested in questions about the implementation of gamification: “how? “,” When?” and “how and when not?”. This study wanted to add an answer to another important question, the perception that students have of the different elements of gamification. Three experiences of different duration were developed, after which students were asked to answer a survey about the gamified elements of the course in which they had participated.

II. STATE OF THE ART

Gamification approaches are methods, processes, and frameworks [19] that help users to systematically define how to use game elements in a specific context not related to the game, such as Six Steps to Gamification [20] or a GAME framework [21]. The number of these approaches has increased in recent years, due to the popularity of the term, the positive results that were achieved and the growing interest in games due to their usefulness and enjoyment, especially in the field of education [22]–[29].

We refer to the design elements of the game as the description of the elements that are characteristic of the games,

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[30] expanding in detail the definition of elements of the game. The game design elements implemented in the gamification are numerous, in [20], [31] we can see a comprehensive list. Elements that are frequently repeated in various contexts [31], [32] and in communities of ideas [33] include game points, social points, badges, and leaderboards. The use of points, badges and leaderboards improves motivation and is considered an appropriate combination of mechanisms in the implementation of any gamification process in higher education [34].

Two meta-analyses found that game elements in general have a positive effect on activity in various contexts (eg, health, education, and marketing). However, such findings are highly dependent on context and user dependence on gamification effectiveness, and therefore cannot be easily transferred to other contexts [31], [32].

In some studies, the effects of gamification vary significantly between participants [35]–[37]. Furthermore, several studies indicate that an element of the game that positively impacts the performance of an individual may not improve or even worsen the performance and motivation of another individual [38]–[40].

For example, while common gamification elements such as points and badges [32] are an important part of the attraction or motivational attraction of volunteer games [41], in the workplace, these elements can be interpreted as a means of control [42], [43]. If we focus on the leaderboards, we find [44] that they show that people perceive the leaderboards differently, which ultimately results in different, and potentially even negative, behavioral results.

A case to consider is [45] where they describe several examples of failed gamification, including Omnicare's gamification initiative for the helpdesk. When Omnicare introduced a gamified scoring system, which included a leaderboard, employees felt that the system was too intrusive, resulting in increased employee turnover rates and decreased customer satisfaction. Only after changing the system design to better adapt to the needs of the employees did the system become a success. Therefore, especially in work environments, where the implementation of gamification can also lead to detrimental results in organizational performance, gamified systems must follow appropriate design choices.

In the proposed study, the perception about the gamification elements in a Moodle course of higher education students with ages around 20 years will be obtained. The first experience lasted two weeks, the second one lasted a month and finally, the third was a full course. In this way we will be able to obtain data that helps us to identify what elements different groups of students in different implementations of gamification perceive positively.

III. METHOD

As part of several experiences, it was decided to analyze the different elements that the GameMo plugin allows to integrate [46]. For the compilation of the information,

a survey with questions valued from 1 (Strongly disagree) to 5 (Strongly agree) was used. These questions were inspired by [47].

A. EXPERIENCE 1

This study was carried out through a course using the Moodle platform like other studies [48], designed to support teaching. It was incorporated as part of the database course taught in the first semester of the first computer engineering course at the University of Lisbon. Its duration was one month in the middle of that semester. The course was about the E/R model and the relational model. The course was implemented on its own server to have greater control over configuration and management. The subject had a theory session and a theoretical-practical session for all students every week, so the students had 2 face-to-face sessions of the subject each week, but the experience was done online as additional tasks that counted towards for the final grade.

1) SAMPLE

190 students of the subject were registered. The average age of the students was around 20 years, as is typical in the second year of computer science degree at the university. The vast majority of the students were men. The students were randomly divided into two groups, 96 in group 1 and 94 in group A. The characteristics of the students, such as age, sex or knowledge of the subject, were not used for distribution. Of the registered students, 85 of the first group and 84 of the second began the activities. After two weeks 8 members of group 1 and 7 of group A dropped out. Eventually, 56 students from group 1 and 57 from group A completed the course. In total 113 students finished and 77 (40.5%) dropped out.

2) METHOD

The course consisted of several tests and tasks related to the subject, both the completion of tasks and surveys would be taken into account for the grade. The group 1 students were gamified the first two weeks, so the survey was conducted at the end of the second week. Group A was without gamification for the first two weeks, and in the last two weeks it was gamified, so the survey was conducted at the end of the fourth week. The number of students in the first survey in group 1 was 85, while the number of students in the second survey in group A was 57. In both groups, we have the responses of students who were gamified for two weeks. Both groups performed the same tasks.

B. EXPERIENCE 2

As part of the laboratory of the subject "New Technologies in Information Systems" it was proposed to carry out a series of activities in a course implemented under the Moodle platform. The laboratory duration was the same as the proposed course, 4 weeks long. The students had 2 face-to-face sessions of the subject each week, but the experience was done as additional tasks that counted towards for the final

grade. The course was about general concepts in computing, hardware, operating systems, networks, security and licenses. The subject is integrated into the university cycles of audio-visual communication, journalism and advertising and public relations at the Rey Juan Carlos University.

1) SAMPLE

The students are in their first year of university, so the average age is close to 20 years. The sample of students belongs to groups of different degrees, but all of them in the same branch of knowledge. Unlike the first experience, this group of students did not belong to a technical profile. By belonging to different cycles and schedule shifts, students were assigned to 3 different groups. The decision did not consider age or previous experience. This group was chosen so that they knew the classmates with whom they shared the course. Of all enrolled students, 174 completed the course and the survey. 67 students from group 1, 56 from group 2 and 51 from group 3.

2) METHOD

For 4 weeks the students were enrolled in a Moodle course that they accessed online. The course was like one more laboratory task to be carried out. Students could complete the tasks at the end of the two face-to-face laboratory sessions per week or at home. After 4 weeks, a survey was carried out on all the students. The tasks of the groups were the same. Just like experience 1, the course consisted of several tests and tasks related to the subject, both the completion of tasks and surveys would be taken into account for the grade.

C. EXPERIENCE 3

Within the block of operating systems of the first year of Dual Vocational Training students of the Cycle of Administration of Computer Systems in Network, and in the subject of computer systems of the first double-degree course Web development and multiplatform of Dual Vocational Training, the platform Moodle was used. Throughout the entire 2018/2019 academic year, the experience of this study was developed.

1) SAMPLE

The sample belongs to students of the first year of Vocational Training of the computer science branch. The age of the students is around 20 years old. Students come from middle grade of vocational training, from high school or from university studies. The course was started by about 60 students, but after some dropouts in the first weeks of the course, only 50 students were registered. Throughout the course there were more dropouts, so the start and end samples are different. The course was completed by 33 students. In this study, a survey was conducted every three months, in the first survey, there were 39 responses, in the second quarter, 38 students continued, and finally, the last survey was completed by 33 students.

2) METHOD

Throughout the course, the theoretical material, the exercises and the activities were posted on a Moodle platform, the students attended three face-to-face sessions of two hours weekly. In addition, students could access the content online. The vocational training course in Spain has three trimesters. In this experience, the first trimester focused on theoretical classes and exercises about hardware; the second trimester had theoretical classes on operating systems, accompanied by practical exercises with the computer. In the last trimester, the PBL methodology was used to deliver network content and administration of operating systems. At the end of each trimester a survey was carried out on the students to analyze the evolution of their perception of the gamified elements.

D. ELEMENTS

There is no clearly defined set of game design elements to create gamification experiences [49], but research often refers to mechanics commonly found in games, such as points, leaderboards, and levels [50]. For this reason, they could not be missing from the list of elements to analyze. The total list of elements analyzed in our study is as follows:

- **Badges:** The badges were awarded for passing a milestone throughout the course. This could be, for example, completing an optional task, completing a mission, or completing the course.
- **Feedback:** Immediate response provided when performing tasks. For each completed task, an automatic response was provided to the student.
- **Missions:** The tasks were grouped by missions. Each mission contained a series of tasks, after completing all the tasks, the mission ended and a badge was obtained.
- **Points:** Certain points were awarded when performing a certain action or delivering a certain task. With the progress of the course, the tasks increased in difficulty and also the number of points that were obtained after its completion.
- **Levels:** Each level required a certain number of points. As points were obtained, users level up. As the level increased, the number of points needed for the next one increased.
- **Leaderboard:** Table showing the list of all the participants. You can see the participants, their score and their level.
- **Time limit:** Time set to complete a task. Time limits were established for the delivery of the tasks and there were time limits for the resolution of questionnaires.
- **Blocked content:** In order to carry out some of the course tasks, completion of a previous task was required. In addition to task locking, there were also locks on certain course elements up to a certain date.

To be able to use all these elements, it was necessary to develop a plug-in called GameMo that allowed everything to be integrated under the Moodle platform [46].

TABLE 1. Experience 1 results.

	GROUP 1		GROUP A	
	Avg.	SD	Avg.	SD
Budgets	2.97	1.06	2.87	1.14
LeaderBoard	3.03	0.85	2.84	0.58
Feedback	3.51	0.71	3.67	0.73
Points	3.17	1.03	3.38	0.93
Levels	3.28	1.23	3.18	1.20
Blocked content	3.08	0.76	3.09	0.49
Time limit	3.25	0.74	3.19	0.73
Missions	3.21	1.06	3.20	1.00

^aAvg = average activity per student, SD = standard deviation

TABLE 2. Experience 2 results.

	G1		G2		G3		Total	
	Avg	SD	Avg	SD	Avg	SD	Avg	SD
Budgets	3.16	1.44	3.06	1.23	3.72	1.15	3.29	1.32
LeaderBoard	2.96	0.72	3.13	0.74	3.22	0.87	3.09	0.78
Feedback	3.30	0.72	3.21	0.64	3.48	0.72	3.32	0.70
Points	3.40	0.72	3.42	0.74	3.84	0.73	3.53	0.75
Levels	3.70	1.23	3.71	1.09	4.08	1.13	3.82	1.16
Blocked content	3.19	0.82	2.90	0.99	3.50	1.00	3.19	0.96
Time limit	2.86	1.06	2.48	1.03	2.53	1.19	2.64	1.10
Missions	3.54	1.02	3.64	1.18	4.31	0.88	3.80	1.09

^aAvg = average activity per student, SD = standard deviation

IV. RESULTS

In this section the results obtained in the groups of students of the three experiences that were carried out will be presented. These experiences were carried out in a virtual Moodle classroom using the same gamification elements.

A. EXPERIENCE 1

This experience had two groups: Group 1 and Group A. The experience lasted 4 weeks, after two weeks gamified (Group 1), the survey was conducted. Group A was gamified the last two weeks, and at the end of the fourth week they carried out the survey. In table 1 we can see the evaluations provided by the students of each group to each element and its standard deviation.

We can see that the evaluation of the elements is similar in both groups after two weeks of gamification. Feedback is the most valued, while budgets, leaderboard and blocked content are the worst valued. Points, levels, time limit and missions get intermediate values.

B. EXPERIENCE 2

In the second experience, 3 groups of students were gamified for a month. At the end of the experience, the survey was passed. In Table 2, we observe the evaluations of each element of the three groups and the global mean. In addition, the table includes the standard deviation.

In this case, the average is shown, as they are groups with similar characteristics, and have had the same experience with the same content and activities. In this case, the time limit is by far the worst rated, followed by the leaderboard. Levels, Missions and points are the best valued by this group of students after 4 weeks of the course.

C. EXPERIENCE 3

The third experience analyzed was carried out throughout a complete vocational training course. The course was divided into three trimesters, at the end of each term the students completed the survey. In Table 3 we can see the valuations of each

TABLE 3. Experience 3 results.

	T1		T2		T3	
	Avg	SD	Avg	SD	Avg	SD
Budgets	3.47	1.15	3.41	1.27	3.23	1.29
LeaderBoard	3.07	0.57	2.94	0.83	2.96	0.77
Feedback	3.11	0.56	3.26	0.64	3.23	0.59
Points	3.28	0.53	3.25	0.69	3.20	0.70
Levels	3.77	1.27	3.55	1.22	3.39	1.25
Blocked content	2.97	1.05	3.11	0.85	3.05	0.94
Time limit	2.47	0.89	2.54	0.93	2.74	0.84
Missions	3.51	1.12	3.16	1.08	3.15	1.30

^aAvg = average activity per student, SD = standard deviation

element and the standard deviation in each quarter (T1 first trimester, T2 second trimester and T3 third trimester).

The best valued component over time is levels. The worst valued is the time limit that improves with time without becoming significant by applying the t-test with a p-value of 0.19. If we apply the t-test, no evaluation of the elements will change significantly.

V. DISCUSSION

Literature suggests that both the nature of games and the elements that make games fun are intrinsically motivating [51], which provides enormous potential for educational application [52]. The central idea of gamification is to transfer the motivating potential of video games to non-gaming environments. However, a simple transfer of game elements is generally not considered sufficient to label this process as “gamification” [53]. Therefore, the simple use of some element does not mean that it is being gamified. This study simply refers to the perception that students have of the elements of gamification of a course and not when its use is correct.

Multiple studies have indicated that the perception of game elements differs at the individual level [54]–[56]. It is possible that the perception of some students of an element does not coincide with that of others. The purpose of this study is to analyze the students perception about a series of the gamification elements used in a Moodle platform in different situations. Three different experiences were analyzed: the first experience had a gamification period of two weeks, the second a month and the third a full course. In all the experiences the students were from higher education. Although the three experiences had different content, all of them were related to computing.

In the three experiences carried out, leaderboard and blocked content were the lowest rated elements. The leaderboard can promote competitiveness [57] and have positive effects, but it can also generate negative effects [44]. What is clear is that for the students of this study, it is one of the elements they like least. The “blocked content” was also poorly rated, this may be due to being higher education students preferring to have all the content and thus manage their progress themselves.

“Time limit” was also one of the least valued elements except for the students who stayed for two weeks. The time limit can serve to force students to advance faster, but it can generate stress [58]. It is possible that the results obtained are due to the fact that in a short experience, the negative aspects of the “time limit” are reduced.

In contrast to the “time limit”, “badges” were highly valued in the second and third experiences, but nevertheless, in the two-week experience, they were not so appreciated by the students. There are many studies on the benefits of Badges [34], it is possible that this being a short period of time, it has not given students time to appreciate them, or that the newly achieved badge did not represent a challenge for the user [59]. It is also possible that students are more accustomed to them since no additional plugin is necessary to use them in Moodle.

Grouping tasks by missions, setting points and levels were very well received by students in all experiences, because they are elements of positive reinforcement. They can serve to motivate students, although we must not forget that, in some cases, they can be seen as an element of control [42]. Along with these three elements, Feedback was also well valued, feedback is considered an essential element by students when it comes to their progress, and can increase their engagement and motivation [60]. The four best rated elements are those that provide the student with a certain sense of progress, which is why these may be the students’ favorites.

VI. LIMITATIONS

This study aims to analyze the assessment of the students of various elements of gamification. We have chosen to include them in all the experiences in order to be able to compare the results. Although there are a wide variety of elements to have a coherent gamification, it is not possible to include all of them, considering more elements does not guarantee

better gamification, rather their mutual relation must be considered [53]. It is possible that different designs with different elements may originate other data.

It was not the intention of this study to establish a comparison between sex or age of the components, the majority of the students were men and were around 20 years of age. In addition to the fact that the reduced number of women in two of the experiences did not allow for it, these analyzes are left for future studies.

These data have been collected in the first experience from a two weeks long course, in the second experiences from a month-long course and in the third experience from a full year. All the experiences were carried out through a course using the Moodle platform, designed to support teaching. It is possible that if the elements are presented differently, or the sample of students is from a different educational field, the evaluation of the elements may change.

VII. CONCLUSION

This study shows the valuations of some gamification elements by students aged around 20 years and in higher education. Three experiences in Moodle with different durations were used (2 weeks, 4 weeks and a complete course). In the three experiences, feedback, levels, points and missions stood out as the best valued. Although badges were also well valued by students in the longest experiences, in the two-week experience it was one of the worst-rated elements.

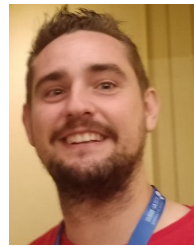
The elements that students liked the least of all those analyzed, were the leaderboard and the blocked content. These elements, like the “time limit”, are useful in the design of a gamified experience, but its use must be well regulated to avoid possible negative aspects, and favor a good experience for the student. The data analyzed in this study may assist in possible future gamification designs.

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