Moodle Gamification applied to Higher Education

David Lameiras, Sofia Sá and Miguel Mira da Silva

Instituto Superior Técnico
Department of Computer Science and Engineering
Av. Rovisco Pais 1, 1049-001 Lisbon, Portugal

Abstract—Considering that students grow up with digital technology, teachers can use it to solve problems that arise during the long learning process, as such, they can use the Learning Management System (LMS) platforms to help and streamline the learning method. Gamification is the utilization of game design elements in non-game contexts and aims to provide intrinsic and extrinsic motivation to participants. This work aims to apply gamification to an LMS, more specifically on the Moodle platform, to improve students’ engagement and more utilization of interactive features in the curricular unit Independent Studies 1. The evaluation of this work will be supported by surveys and interviews made to students who participated in this demonstration. Based on the results obtained, it was realized that the gamification application used did not support the intended objectives, because it presented some bugs that influenced the attribution of Experience Points (XP). Despite this, the proposal demonstrated positive results in terms of gamification, showing to be effective in motivating students carrying out the tasks, improving the interaction between them and the use of Moodle for sharing materials. It was also noticed that gamification is a topic to be considered in the educational process.

Index Terms—E-learning, Learning Management Systems, Gamification, Moodle, Engagement, Higher Education.

1 INTRODUCTION

The evolution of communication networks has a great impact on education. This affect how education is being provide in several levels, including higher education, leading them to an innovative type of learning.

From the growth of internet utilization and the variety of types of multimedia technology surged e-learning or online learning. In this article [7], the authors defined e-learning as “all forms of electronically supported learning and teaching, which are procedural and aim to affect the construction of knowledge concerning individual experience, practice, and knowledge of the learner. Information and communication systems, whether networked or not, serve as specific media (specific in the sense elaborated previously) to implement the learning process.”

The concept of e-learning plays an important role in education, having a special relevance in the instructional component, supported by LMS, such as Moodle. In this system, students can access courses’ content in different formats, as well interact with teachers and/or colleagues, through message boards, forums, chats, or other types of communication tools [6].

The LMS involves challenges [1] for teachers and students such as content management, feature utilization, teaching and learning methods, learners’ engagement, and assessment management. This research will focus on two specific issues - the lack of interactive features use and the low level of student engagement - of the LMS.

To develop this thesis was applied the Design Science Research Methodology methodology [5]. This methodology was designed to create, evaluate and improve new IT (Information Technology) artifacts.

The proposal was developed using the 6D framework [8] and consisted of the incorporation of gamification methodologies and strategies in LMS. This allowed studying the correlation between the solution and the identified problems, verifying if the solution minimizes the issues, since studies show the methodology has positive results. Gamification consists of using game elements in non-game contexts to enhance the motivation of participants and make the content more attractive, leading the people to engage in their activities to achieve goals.

To demonstrate the proposal, platform Moodle1 was used with the plug-in Level Up! – Gamification in the curricular unit of Independent Studies 12 taught in the first semester of 2019/2020 on master degree in Information Systems and Computer Engineering in Instituto Superior Técnico (IST). This curricular unit consists of developing teamwork skills, increasing the student’s ability to express ideas, and developing soft skills, to prepare them for their future progress at work.

To evaluate this proposal it was used the results collected from the students and, at the end of the course, surveys and interviews were conducted to prove the validity of the proposal.

2 PROPOSAL

To solve the identified problems in the Introduction, it’s proposed the development of a gamified LMS in the curricular unit that will allow to improve the engagement and the utilization of interactive features.

To introduce the gamification in the LMS was applied the 6D framework, mentioned in Section 1, that will be discriminated below.

2.1 Define Business Objectives

The main objective is to increase the engagement in order to raise accomplishment of the tasks proposed to the participants and increase the utilization of interactive features, keeping the quality of the education provided in the course.

2.2 Delineate Target Behaviours

In this step, it’s describe the players’ behaviour to achieve the objectives.

In order to obtain the maximum grade in the curricular unit, students have to complete the gamified component whose maximum XP is 4000 of the 5000 available. Students have at their disposal several tasks from which they can choose some according to their preference, thus giving students the possibility to choose their path and how they intend to develop their game.

It is intended to obtain more information from students through surveys and interviews to analyse the results of gamification.

2.3 Describe your Players

Self-Determination Theory [3] mentioned that humans tend to engage in activities when they feel motivated. One of the ways to motivate them is through positive feedback that enhances their intrinsic motivation. This is important to raise motivation and engagement of the students, allowing them to obtain better results and feel encouraged in the participation on LMS.

The players are higher education master’s students, who are very comfortable with technology, because of the course they take. To characterize the players was carried out the Bartle Test.

2.4 Devise your Activity Loops

As referred above, participants should completed the LMS curricular unit until the end. For such, it was necessary to define activity loops that allowed an action to trigger a series of activities and behaviours from the system. The activity loops were divided into two, the engagement loops and progression loops.

The engagement loops consist in the attribution of activities to users during the participation of the LMS curricular unit. Then they receive feedback and rewards based on their performance, motivating them to participate in future activities.

As the students carry out the activities proposed in the LMS, they get the perception of the work done so far. Here is where the progression loop enters, represented by players ranking position in the leaderboard.

2.5 Don’t Forget the Fun

To ensure players’ fun should be taken into account the utilization of the activity loops, since players will be motivated by receiving rewards when overwhelming challenges are presented to them, feeling enjoyment for completing their task.

To keep the players enjoying the curricular unit was decided to give players the option to research extra information about the content developed in class and share with the other users, using the gamified LMS.

To not make the game boring, it was decided to introduce the concept of player agency, giving the freedom to play the game in the way that best suits them. Player agency stems around the player’s ability to make meaningful decisions, those are originated from different structures within the game. However, the structures of those decisions provide the player the sense and how their decision might affect the game’s outcome.

To further motivate the players to achieve the maximum XP, was added the leaderboard to players had the feeling they was experiencing a competition between them.

2.6 Deploy the Appropriate Tools

In order to develop this gamified LMS, it was necessary to use some tools to fulfil the proposal needs. Besides the elements that have already been described in previous steps, there was a need to do a complete list of features that must be included in the system:

- The LMS platform should support the use of gamification methodology;
- The LMS platform must support experience points (XP) and badges that are obtained by the players of the LMS course;
- The LMS platform need to support a leaderboard to all players;
- Players can get experience points (XP) by the activities proposed;
- Users will get badges participating in forum and extra activities;
- Utilization of google forms application to develop and retrieve information in surveys made to players.

3 IMPLEMENTATION

This demonstration was held in the curricular unit of Independent Studies 1 from the Instituto Superior Técnico (IST), taught in the first semester of 2019/2020.

In the proposed solution, an Learning Management System (LMS) was used through Moodle platform. In order to implement the gamified component, was used the Level Up! - Gamification.
To students achieve the maximum grades, they needed to participate in the gamified evaluation component. The strategy used to implement this methodology started to be aligned with the professor from the curricular unit, discussing what should be done for Experience Points (XP) points and the gamified component.

After that first meeting, the gamification was only applied to a specific evaluation component, worthing 4000 XP, which corresponds to four values of the students’ final grade. This 4000 XP was divided in several tasks proposed to the players.

In order that players felt the notion of agency during the game, 1000 more XP were added to the 4000 XP classification, which was distributed by the proposed tasks.

There were some difficulties in applying the badges component on the Moodle platform during the implementation process. Due to this problem, it was questioned the implementation of this component or if it would just continue with the XP allocated for the execution of tasks and the leaderboard.

There was a need to abandon the implementation of badges due to the difficulties that the platform raised and due to time management issues.

After completing the definition of the components of gamification used, there was a need to define what tasks would be created and how XP would be earned during the execution of these tasks. To arrive at the final version, it went through several phases presented in the figure 1.

--- Table 1. Gamification XP distribution (second version) ---

<table>
<thead>
<tr>
<th>Nº</th>
<th>Task</th>
<th>XP/Task</th>
<th>XP Available</th>
<th>XPMax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>XP for sharing work publicly</td>
<td>50</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>2</td>
<td>Meet the deadlines for each task</td>
<td>50</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>XP for giving specific and fair feedback to a shared work</td>
<td>50</td>
<td>500</td>
<td>350</td>
</tr>
<tr>
<td>4</td>
<td>Extra xp for different formats in the presented product</td>
<td>150</td>
<td>450</td>
<td>300</td>
</tr>
<tr>
<td>5</td>
<td>Extra XP for finding materials on the topic and sharing</td>
<td>125</td>
<td>500</td>
<td>350</td>
</tr>
<tr>
<td>6</td>
<td>Xp for explaining a content with an example / story / case study</td>
<td>150</td>
<td>450</td>
<td>300</td>
</tr>
<tr>
<td>7</td>
<td>Extra work on another topic related to the topic covered in class</td>
<td>150</td>
<td>450</td>
<td>350</td>
</tr>
<tr>
<td>8</td>
<td>Extra quizzes on topics covered in class</td>
<td>50</td>
<td>400</td>
<td>300</td>
</tr>
<tr>
<td>9</td>
<td>Interviews</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>10</td>
<td>Surveys</td>
<td>100 / 250</td>
<td>350</td>
<td>350</td>
</tr>
<tr>
<td>11</td>
<td>XP for extra face-to-face presentation session</td>
<td>500</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>12</td>
<td>Hall of fame</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
</tbody>
</table>

--- Figure 1. Evolution of the XP earning ---

In the first version, which tasks should be implemented were identified and the gain of XP intended to scale as the task execution objectives were achieved. Due to the incompatibility of the tool, this hypothesis was abandoned, being transformed into a linear gain system XP.

Table 1 shows the tasks and XP distribution defined in the second version. There, task number 2 refers to remote students, since students who participated in classroom received XP for their attendance.

At the next meeting, the second version fell, and was created the final one. This new version maintained the same type of tasks, but presented them differently, organizing them by categories. Was also covered formal access to ULisboa’s Moodle platform for IST teachers and students, and the installation of the Level Up! plug-in.

In this version, the tasks and the XP associated to each one of them were divided into six categories. The purpose of these categories, in addition to organizing the tasks, was to facilitate their perception for the participants, since most of them had their first contact with this method of evaluation. The categories were the following:

- **Share with the researcher**: it consists in tasks that will be requested during the semester to participants in order to contribute to this thesis results, for example, participation in surveys and interviews;
- **Hall of fame**: to add a reward to the end of each chapter of the game (week tasks), was created a category to highlight the bests task done by players. In each one, 1 to 3 works will be chosen to the hall of fame. The player can communicate to the admin of the game if he allows to post it or not varying XP gain based on his decision;
- **Creativity zone**: after classroom, players could produce and present a video related to the content covered in each chapter of the game. The more people make the video, the more XP they get, as students need to collaborate on making it; The purpose for this category was to promote teamwork between players;
- **Extra mile materials**: players can share materials
like articles, videos, podcasts, infographics, blogs, texts related to the topics addressed in each chapter of the game. Each share has corresponding XP, considering the explanation on why he chose and what is the connection to the topic. This would promote sharing knowledge with the other players and produce more content to the feedback addicts category;

- **Quests:** this category consists of challenges that players as to solve or suggest to the admin of the game. The reward is higher if was the player suggesting the challenge;
- **Feedback addicts:** this topic consists of motivating/improving communication between players. It’s possible to give feedback to tasks, hall of fame, creativity zone, extra materials, and earn XP with that. It’s also possible to give anonymous feedback to classes and assignments, earning XP for it.

As previously mentioned, for each class there were tasks associated. The table below shows the detailed information of all tasks grouped by category and which XP was associated with each one.

Table 2. Gamification XP distribution (final version)

<table>
<thead>
<tr>
<th>Category</th>
<th>Tasks</th>
<th>XP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share with the researcher</td>
<td>Fill first form</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Fill second form</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Fill the two forms - Bonus</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>Participate in interview</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Participate in Focus Group</td>
<td>700</td>
</tr>
<tr>
<td>Hall of Fame</td>
<td>Having a task chosen for Hall of Fame</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Allowing task to be published in Moodle</td>
<td>30</td>
</tr>
<tr>
<td>Creativity</td>
<td>Post a video made by the player</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td>For each person extra participating in the video - Bonus</td>
<td>100</td>
</tr>
<tr>
<td>Extra Materials</td>
<td>Sharing materials about the topics of the curricular unit (articles, texts, blogs, podcasts, videos)</td>
<td>200</td>
</tr>
<tr>
<td>Quests</td>
<td>Suggesting a communication quest</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Presenting a solution for a communication quest</td>
<td>100</td>
</tr>
<tr>
<td>Feedback Addicts</td>
<td>Post a full task made by the player and ask for feedback</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Give feedback to other players posts</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Provide feedback for classes and tasks</td>
<td>150</td>
</tr>
</tbody>
</table>

For some categories, the admin of the game felt the need to create some complementary conditions at the tasks execution.

In **Creativity Zone** the videos must have a minimum duration of ten minutes and a maximum duration of fifteen. If the video has more than one player, the XP is distributed equally by each other, as long they actively intervene in the video by presenting a portion of it. Bonus XP and XP for other video of participants that not the ones that posted is applied manually.

Each share in **Extra Materials** required an explanation in text with at least 400 characters, about the choice of the specific material and its relation with the subject. At the **Quest** category, each player, when posting a response to a communication quest, is able to view other responses half an hour after his post.

Every post that players do on **Feedback Addicts**, to be considered, must be respectful, specific, descriptive, positively written, and indicate at least one positive and one improve aspect. The feedback was 100% anonymous, leaving only the record of the author for validation in the Level Up! plug-in.

Finally, when access to the platform was granted, tests started to understand whether the last version would be supported on the platform and whether it would be possible to accomplish everything that was planned. With these tests, it was thought whether it would be possible to assign XP manually and under which conditions. For example:

- How do we give XP to whoever makes a video with more people?
- How to assign XP to whoever show up in video?

To understand whether the two points worked, it was necessary to carry out some tests with student profiles. After their execution, it was concluded that it would be impossible to implement all the proposals due to some bureaucratic problems in terms of management in Moodle platform, and it was found some limitations on the Level Up! plug-in.

It was also concluded that the Level Up! plug-in had the possibility to add and remove XP manually, and wasn’t possible to capped XP earning. So it was decided to leave these parts for manual management made by the professor.

The organization of the distribution of the total XP in levels was also made by the professor, who decided to create eight levels of 500 XP each.

After some frustrations and conclusions that were drawn from several meetings, the final version was reached with all these adjustments, and others required along the semester. For example, the hall of fame category never came to fruition due to problematic issues and the workload associated with its good execution.

4 Results

This section described how the evaluation of the proposal was done and showed that it is appropriate to solve the research problem. To perform this evaluation was carried out the following steps:

- Retrieve statics data during the execution and at the end of the Independent Studies 1 curricular unit;
- Realization of two surveys during the semester and interviews with players to retrieve feedback at the end of Independent Studies 1.

The realization and extraction of data from the survey were carried out in Moodle. In the interview process, the planned approach to conducting the interviews was the
use of focus groups [4]. This approach was chosen for a more personal and detailed assessment of the players experience, and what their opinions were in relation to the gamification and Moodle in this curricular unit and if they felt more engaged in it.

Focus group consists of a group discussion of a particular topic organized for research purposes and is guided, monitored, and recorded by a researcher. Was decided on this method instead of normal interviews, since it is recommended to generate information on collective views and the meaning behind them. They also were good because they facilitate the understanding of participants’ experiences and beliefs.

Based on the feedback obtained in the evaluation of the participants from the first edition, improvements were presented so that they can be implemented in next editions of the Independent Studies curricular unit.

A total of 331 players participated in this iteration, and the results obtained were very positive. First, the results of the first survey will be analyzed, followed by the second one and the interviews.

4.1 First Survey

The first survey aims to understand the type of player’s involvement in this curricular unit, some habits and preferences of the players’ games were asked and, lastly, a survey of Bartle test was made in order to determine the type of the players. These surveys were executed in anonymous way and performed on the platform Moodle.

At the beginning of the survey was found out that the majority of the players were from male gender with 211 results and 58 females. Only 40 of these participants were student workers. The large percentage of males is due to the curricular unit belonging to a computer engineering course, where the majority of students are male.

As for the gaming habits and preferences of the players, the majority play at least occasionally. With this was concluded that many participants have regular contact with games and like games. The devices that players usually use go through the personal computer, smartphone and game console, but what they use most is the personal computer with 64% compared to the second place with a 19%, as can be seen in the figure 3.

Regarding the type of game, was observed a great variation among the players, perhaps with emphasis on the type of sniper and survival horror game, with the shooter being the most chosen with 115 choices and survival horror the least chosen, with a total of 14 choices.

In this figure, it can be seen that 57% of the players prefer multiplayer games instead of single player, which demonstrate that players prefer games where exists cooperation and teamwork to defeat human opponents instead of playing versus AI of the games.
Figure 6. Behaviours and habits that describe the players in this curricular unit (based on [2]).

From the results obtained, players consider most of the statements as characteristic of them in this curricular unit. It’s also worth mentioning 5 statements that many of the players didn’t identify with: using Moodle forums or talking to the professors outside of class to review assignments or ask questions, looking for extra material besides classes, raising my hand in class, taking notes in class and asking questions when I don’t understand the professor.

For the first and second statement, the proposal intends that these were an objective for the players with the tasks developed and with the gamification methodology, in order to make the players more involved in the proposed tasks. Moodle allowed players after class to participate in the task proposed by the teacher and to share material between them and receive feedback either from other players or from the teacher, trying to improve the number of students with the characteristic presented in last point.

4.2 Second Survey

In the second survey the objective was to retrieve information to understand the engagement of the players during the game execution and take conclusions about the implementation.

The players were asked 11 questions, the first one was whether they participated in the first survey, the second and third were about gender and if they were working students, then 7 questions were about engagement and relating it with gamification and, at last, were presented 20 statements to players to evaluate them from strongly disagree to strongly agree.

In this survey, a total of 140 answers were obtained. From these only 122 players answered that they did the first survey, which is not comparable with the total of 275 responses in the first one, making impossible to correlate the results.

As for player’s gender can be understood that, compared to the first survey, the female gender didn’t have a great discrepancy as in the male answers. It went from 58 female answers in the first survey to 40. And, in the case of males, it went from 211 to 100 answers. Regarding to the student worker, it had a great discrepancy between the two surveys. In first one, were obtained 40 answers as yes and 230 as no, and in second one were obtained 18 responses as yes and 122 as no.

In terms of engagement it can be seen that 33% of the participants were more engaged in this curricular unit, and 34% were equal engaged, giving a total of 67% of players with equal or more engagement. Due to the fact that the curricular unit is not technical and worth a few ECTS, it would not be expected such a high engagement rate, as was seen in the results obtained.

Figure 7. How engaged are you in this curricular unit, compared to others you are taking, in a scale from 1 to 5?

In the figure 8 can be understand that most participants qualified the two statements as important and relevant to study, they probably had this opinion since they already heard the concepts and felt the power of them, like the next figure show.

Figure 8. Gamification and Engagement are relevant areas of study?

As the survey progressed, player opinions on the relationship between gamification and engagement dispersed. Despite this, most participants agreed that gamification improved engagement in this curricular unit.

Figure 9. Do you agree that Gamification can increase users Engagement?
Figure 10. Do you think that you had the same engagement in the curricular unit without the gamification?

In figure 11 can be observed that who answered this survey thought that Gamification and Engagement should be taken in account in educational process, with a 74% of participants saying probably and definitely yes.

Figure 11. Gamification and Engagement should be taken in account in Educational process?

Finally, at the end of the survey, a list of questions was made, which were divided into 4 subgroups at the analysis phase. In this questions, participants were asked to rate from 1 to 5 (strongly disagree - strongly agree) the importance of the statements presented in relation to their experience.

In figure 12 can be seen that an average of 22.8% of the participants agreed that gamification had no impact on learning and that the use of gamification was a good idea. Others 58.8% agreed that gamification brought benefits for their learning and to point out that 73% of the participants agreed that it was a good idea to use online gamification. One of the most relevant positive result was the improvement of learning performance using the online gamification with a 48% of players agreeing with this quote. About the other three quotes can be said that players were well divided.

Figure 12. Gamification in learning experience?

The majority of participants’ answers (75%), agreed that the gamification was flexible and clear to use, as can be observed in figure 13.

Figure 13. Gamification in learning experience?

In the figure below was pretended to understand the players’ experience with the leaderboard and the feel of an evaluation system based on participation and attendance, instead of just exams and assignments.

Figure 14. Leaderboard and participation evaluation.

In the results observed in the figure 14, only 39% of players founded that was important to sample the overall ranking at the beginning of the class, with 10% strongly agreeing and 29% agreeing. In the question where they were asked if they felt uncomfortable with the overall ranking sample, 59% of the players answered that they didn’t care, in which 36% strongly disagree and 23% disagree. In last statement players valued an assessment that is not based solely on exams and most of them prefer an assessment component for participation and presence.
Points, Positive Points and Future Work

Video, Bugs, Communication and Sharing, Negative

Several questions were grouped in 6 major categories -

- Due to gamification I paid more attention in class.
- Due to gamification I tried to participate more.
- Due to gamification I tried not to miss classes.
- Due to gamification I communicated more with my colleagues and/or professor.
- I was more focused and attentive due to gamification.

![Figure 15. Impacts of gamification in classes.](image)

With the results presented in the figure 15, it appears that the implemented gamification did not promote attention and attendance in the classes for a large percentage of students. However, it can be seen that some students agreed that gamification promoted these actions with higher percentages for participation, attention and focus, and communication between teachers and students.

4.3 Interviews

In the results of the interviews, ten participations were obtained from the 331 players. At this stage was expected to have achieved a greater participation, since many of them still didn’t had the maximum XP, but that didn’t happen.

Due to the low participation, it was necessary to adapt the focus group method. As such, it was adopted individual interviews and peer interviews. In the peer interviews it was applied what would be to the focus groups, but on a small scale.

To analyse the content of the interviews, a tracing was applied to the audio records, because to the interviewees were given the opportunity to speak openly about the topics covered, generating some rambling.

To organize the results, the interviewee was anonymized and the answer content was extracted into an excel file, in which the same topics appears in several questions were grouped in 6 major categories - Video, Bugs, Communication and Sharing, Negative Points, Positive Points and Future Work.

During the interviews, one of the objectives was to understand why not even one player made the video task. Some of the feedback that were retrieved from players appointed to two major problems. The first one, common to all, was that many of them do not like exposing in front of a camera or the others. The second one, mentioned by five of the interviewees, was that the need to earn XP versus the effort to make the video was low. Some players also pointed that videos should have been better explained, like what kind of videos could be made or the difference of the XP obtained according to the participation in it.

During the semester, players had some bugs on the attribution of XP while they were performing tasks. So they were questioned, individually, and three of the ten answered that didn’t experience any bug. Only one player affirm that found a glitch on the system and tried to explore it but was unseduced, since it was detected immediately. Beside that, others players mentioned that they experienced small amounts of bugs.

Due to the sharing of materials and the interaction that existed between the players, it was tried to understand if there were advantages.

All the participants emphasized in the interviews the increase they had felt in the communication between them and who had found a lot of interest in this addition in the curricular unit, stimulating the interaction after class. They also said that sharing content was beneficial and motivated interaction. It was also highlighted the performance of the teacher in the management of the platform and the dynamism of the tasks proposed. One of the players stated that “the component of the Moodle could have been more reminded to students, due to the division of the platforms”.

This division of platforms was appointed as one of the many problems that players identified, since they said that the Moodle turns out to be somewhat overlooked due to the division between the Fenix and the Moodle. Five of the interviewees appointed flaws to the Moodle. Two of them said that the XP should be discriminated in the Moodle page and didn’t like the organization. Other two didn’t like the organization of the topics on Moodle, and each of them pointed out another negative aspect. The first one was the spam of emails when someone commented a post, in player’s opinion although, this could be disable by them, should be disabled by default. The second aspect was the possibility for Moodle to allow evaluating posts made by players.

As for the problems pointed out in the gamification to be solved, besides the bugs in the Level Up! plug-in, some players, that only completed the tasks at the end of the semester, affirmed that ended up not enjoying 100% of the game. Despite this, in the interview, they recognized that if they repeated the process, they had done things from the beginning, because when they did it, they even liked the system implemented.

In the interviews, 80% answered that they wouldn’t changed the XP system of the game, but at last question they were asked if they had improvements to point out and players introduced some changes to the XP organization, but never modifying the XP system based on XP retrieve completing tasks. Regarding to gamification two players suggested an improvement on applying some complexity to the evolution during the game.

For the improvements on XP organization, they coincide with the most controversial problems presented before, like the videos and the feedback made by the
players.

Some improvements for Moodle were presented by the interviewed, most of the suggestions was about organizational issues and aesthetics.

One last improvement suggested by three players was tasks with timeline. The existence of some tasks that would only be available during some time, this could improve one of the problems mention above based on the time organization of players during the semester.

The player type was also questioned, but only four of interviewees remembered what had been attributed to them in the survey. It would be interesting to cross this data with them if every one reminded his type, but for those who remember it was good since the player really defined the answers during the interview in some subjects discussed.

At last, all the players interviewed agreed that this curricular unit should continue being gamified with Moodle and be improved despite the flaws that were discovered. All mentioned that this methodology should be applied to other curricular units from their course, for example Gestão and Análise e Modelação de Sistemas.

4.4 Participation in Moodle

By the end of the semester, information about the players XP were retrieved to understand two important aspects. The first one was to see the difference between the real XP, controlled by the professor, and the final XP, retrieved from the Moodle using the Level Up! plug-in.

In the figure 16 can be seen, the first aspect, the failures presented by the Level Up! plug-in, 64% of the players did not obtain the same results between XP on the Moodle platform and real XP, and between them, 52% had a final XP higher than the real XP.

The second aspect was to analyse the players final XP, in the figure 17 it was divided at intervals from 1000 XP up to the maximum XP available. Based on the distribution, can be seen that 50% of the players had scores up to 2000 XP, and 14% went beyond the maximum XP, almost as many as those who had XP between 2000 and 3000.

Figure 16. Real XP vs Moodle XP with Level UP.

The problems presented in the plug-in didn’t avoid users of enjoying and had fun with this experience, and the results from the application of gamification were positive like demonstrated before. In conclusion, to implement gamification the most important aspect it’s not the platform chosen, but the game plan and organization.

Based on the analysis of the results, it was noticed that the participants like games and are usually assiduous players. The platforms they prefer to play on are the computer, smartphone and video game consoles, preferring, the vast majority, their personal computer. They play a wide variety of game types, at least 16 different
and have a greater preference in multiplayer games than single.

For the participants, engagement and gamification are two relevant areas to study and should be taken into account in the educational process. According to them, gamification should be implemented in more curricular units, not only because of the results, but also because they liked the way it introduced more dynamism and differed from the traditional method of teaching.

The vast majority of participants agreed that gamification is a methodology that increases the engagement of people and, in this curricular unit, it had the same effect, as was observed in the results. At the end, it could be concluded that gamification had positive impacts in higher education and can engage and give more fun to students in their curricular units.

In future implementations some improvements could be applied to Moodle. The Experience Points (XP) breakdown on the Moodle page is undoubtedly an important improvement as it immediately makes it easier for users to get the score assigned to that task. In order to combat the division between the two platforms - Moodle and Féniç -, it is suggested that the information be replicated on both.

A way to implement quality assessment of posts, for example a peer review system among users, could also be tested, in which the teacher could intervene when a set of evaluations was negative, penalizing the student.

After evaluating and reflecting about the videos, it is suggested they continue as an option, although should be tested some hypotheses to motivate users make it. The first suggestion was increase the reward for individual video, secondly to assign an extra reward to those who publish the first, define the types of video in order to better explain what could be done, and for last the addition of podcasts.

Regarding gamification, two improvements that should be done are the addition of extra challenges - boss challenge - to overcome a certain level and the introducing a timeline for task execution, motivating players to be more attentive and consult the Moodle platform more regularly.

With the results and feedback obtained from users in terms of gamification tool there are two options, understand a way to surpass the issues identified or search another gamification tool that had the possibility to be integrated in Moodle and does not present this errors.

Once a solution has been found that brings together the necessary characteristics to fulfil the objectives proposed in this implementation. It would be useful to create a manual that encompasses technical and pedagogical implementation (namely the award of XP) to support future implementations by other higher education teachers. Promoting the amplification of the beneficial results that were obtained in this study for other contexts.

**References**


