Social gamification in education: a gamified platform based on the Elgg framework

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Abstract— **Education, MOOCs and gamification are growing together over the recent years to help students to get better academic results. A literature review was performed to detect the main gamification elements used in current educational field. Therefore, we have modified the well-known Elgg social platform to add some gamification elements to the system. These elements were points, achievements, leaderboards and rewards. For the future, we are planning experiments with students to verify the effectiveness of these elements for engaging students.**

Keywords— *Education; MOOCs; Gamification; Elgg*

I. INTRODUCTION

With the technological evolution of the education systems and the incorporation of game elements (gamification) in completely different contexts other than games, it is necessary to combine education and gamification to enhance the engagement of students, which impacts in a better academic performance and longer time spent in e-learning systems.

Gamification has successfully been incorporated with commercial purposes into platforms (e.g. Badgeville), in order to create relationships between platform and users, and to increase the popularity of the platform. This success suggests that it could also be used in education as a tool to increase student engagement and motivation [1].

Moreover, gamification is a relatively new field with a promising potential that teachers and researchers are just beginning to unveil. Due to this, recently an increasing number of studies have emerged in the use of gamification in e-learning that analyses its potential impact on learning outcomes. Although results are mostly positive, some caveats exist [2, 3].

Firstly, a literature review was performed to detect the most common gamification elements that could be applied in MOOCs (Massive Open Online Courses). Then a social gamified platform (i.e., a gamified learning platform with social network elements in it) has been developed to improve the motivation and engagement of students, which are very important in MOOCs to reduce the dropout rate.

This paper is distributed as follows: Section 2 shows the background of gamification and its elements. Section 3 presents the deployed platform and the developed gamification elements. Finally, Section 4 presents some conclusions.

II. GAMIFICATION

Gamification is defined as the use of game design elements in non-game contexts [4-6]. More precisely, gamification elements act as an effective methodology to drive user behavior [2, 5, 7, 8]. For Mekler [7], gamification should be applied in short term. In contrast, for long term approaches, other elements should be combined (or even consider it as a journey [9]). It should be taken into account that results are highly dependent on context and users [2].

Besides education, gamification elements have been tested in many other areas, such as an online community [10] to encourage participation; a physical exercise application [11] to improve recognition and social interactions; a gamification guide for Mobile Social Networks to engage users[12]; a study on business project management with gamification [13]; a gamification guide to enhance business process [14]; gamification elements to be used in business (and education) training activities [15]; among others.

A. Gamification in Education

First of all, the motivations for the students to continue learning have to be studied. For Burguillo[16], tournament environments (for extra points) enhances learning performance of students. The author stated that extra points must be considered as a reward method, but not as a punishment method; and tournament environments should be set at the end of a course in order to avoid lack of interest of unsuccessfully players. For Baker[17], gamified classroom environments should include goals (plain and agile), obstacles (challenges) and collaboration/competition elements. Authors stated that algorithmic classrooms could produce negative effects on students. According to Shernoff [18], students go by diverse psychological states: apathy, relaxation, anxiety and flow. Flow is very important for productivity of learning since it makes the student to be in a complete immersion sensation, composed by high levels of concentration, interest and enjoyment. A study of flow and immersion on game-based learning students [19] shows that engagement and flow are related with convincingly learning outcomes. Also, it is shown that performance acts in between of immersion for science learning.

But, after all, further research and development about this subject is required [20], with special attention to new technologies and methodologies, such as MOOC courses,

mobile and gamification, because they are presented as new trends in Education (from 2013 and beyond) [21].

In the field of education, gamification has been widely studied and discussed as an element to encourage learning over the past years (at least since 2010).

Generally speaking, applying gamification elements on educational contexts seems to have beneficial effects on students [22]. At least, both elements enhance education outcomes, as seen in a study to create a gamification learning theory [23], remarking that the application of gamification should be to enhance education, instead of replacing it, and gamification should be understood as the effects on learning outcomes of moderation (improving learning process) and mediation (enhance behaviors or attitudes), deployed together or individually.

Two are the main benefits of this partnership. Firstly, motivating the student to continue learning. For Raymer [24], learning materials should be divided into short/medium/long objectives (reduces cognitive fatigue and adds engaging, but increase the design of the course). Required skill should increase proportionally with the necessary challenged. Their research also shows that students' acceptance to other students is the best effective motivator. As studied by Muntean [8], gamification makes enjoyable for the student while it keeps the credibility, but students must be, at a time, motivated, skilled and ready to act in order to complete objectives. Better results are expected if the students expend more time with the system.

In a study of a gamified plugin for an e-learning platform [25], the authors stated that gamification scenarios could be a source for motivating students, but with high efforts of design and implementation. In this line, in a study of gamification and motivation [26], authors stated that simple gamification elements are enough for encouraging students (even those unmotivated) to learn and interact with others. These gamification elements should be implemented with other type of methods and applying qualitative measurements.

Secondly, producing better learning performances. Su and Cheng [27], in their study on a gamified learning mobile environment, found that an approach joining m-learning and gamification produces better results than the traditional learning environments with m-learning, since gamification is able to increase motivation and learning outcomes of students. In a subsequent study [28] that compared gamification and social networking approaches, the results showed that both methodologies are good for improving performance of the students. In short, it is essentially to create accurate designs and objectives for good learning-gamification integration.

On the other hand, some studies pointed out some deficiencies or drawbacks of mixing gamification and learning lectures. The first one is that some studies did not found enough evidences on learning performance outcomes. In 2008, a study [29] about motivations and attitude of gamification in interactive learning environments found that students did not show any relation between learning performance and gaming attitude, while teachers suggest that an interactive environment would help students in a more effective way. The decision to game is related (for 1 in every 3 studies) to frustration, technology handicap, learning environment and students' opinion about the teacher. Dicheva [30] discovered that there is insufficient empirical research to assert that gamification is effective in learning environments. In their research, the most popular tendencies on gamification in education were "*visual status*", "*social engagement*", "*freedom to choose*" and "*rapid feedback*". As shown in a review of gamification by Erenli [31], there are three important aspects of gamification in education. Firstly, it could be considered as a virus to the students (current studies do not show if it is a good or bad virus). Secondly, students affected by addiction disorders (caused by game elements) should be treated in a different way than the other students. And, thirdly, teachers should know how to respond properly in case of students require the implementation of gamification in the classroom.

In opinion of other authors, gamification (although it is useful within educational contexts) should be applied with other techniques for better results [26]. For instance, de-Sousa [32], in their review of gamification in education, found that motivating students could be stronger accomplished if four strategies (behavioral change, improving learning, socialization and engagement) are combined in gamification-educational environments. As derived from the pedagogical analysis of gamification performed by Bíró [33], technology is not the key of gamification concept (it is not about Computer-Based Learning). Instead, all gamification elements should be focused on enhancing motivation and engagement of students. For them, teacher should be only in charge of creating the environment, prepare learning contents and supervise students.

B. Gamification in MOOCs

Within education, and specifically in an e-learning context, MOOCs rise themselves as a new learning format. As a matter of fact, not too many references have been found that relate, or that implement, gamification elements with MOOC courses (and not before 2014). This suggests that they seem to be a very innovative mix and this technology should be studied in depth, since it promises to be a very effective technology to enhance students' engagement and online courses.

Under the results of Gené [34], who implemented a P2P (peer to peer) learning course that was highly successful for students, gamification enables long-lasting existence over time and costs-benefits viability of MOOCs. For Chang [35], gamification helps students in what MOOCs fails: turn them into efficient and effective learning. Additionally, they present a list of gamification mechanisms and their engagement level ("*virtual goods*", "*redeemable points*" and "*team leaderboards*" elements provide the best engagement). The limitations are that learning results were not studied and exhaustiveness of the presented mechanics was not guaranteed.

On the other hand, Spector [36] considers that the association between gamification and MOOCs is an immature alliance until permanent support and formative and summative feedback are provided to students. The author also states that simulation-based learning is a better strategy to enhance learning capabilities than game-based learning because, although games promote engagement and motivation, game strategies are limited in learning reinforcement strategies. For

Baker [17] is not obvious how to create effective MOOC courses to make them balanced for all students.

C. Gamification Elements

Once previous literature review applying gamification in educational environments has been presented, a list of gamification elements in education is introduced:

- **Points**. Consists of providing points to the student for completing activities/tasks. Actually, they are the baseline for other gamification elements such as levels or leaderboards [37]. Mainly, points provide a success feeling [38], followed by a visual status [30] (to oneself or for the rest of students) and instantaneous feedback to promote motivation [39, 40].

- **Levels**. Typically implemented with points, levels are used in order to make the student raise his/her status [38, 40] and contribute to the engagement [30] and feedback [40]. Initial levels are usually agile to reach. Higher levels require, on the contrary, more effort and skills [38].

- **Achievements / Badges**. These elements are special marks rewarded to the student when particular activities/tasks are completed, and also increase the quality of contributions [41, 42]. They are highly related to visual status and social engagement aspects [30, 38]. This gamification element is highly motivating, fun and encouraging [25, 26, 38, 43]. In this matter, it is important to let the student see all badges.

- **Leaderboards**. This element consists of a list of names/nicknames/avatars showing the current/total score of the competitors (students). This promotes visual status and social engagement [30], along with competition and high levels of motivation feelings [25, 26, 38, 40] and enhances learning performance [44]. To face the feasible demotivation attitude of the students (created by the competition introduced within leaderboards), a possible solution could be balancing the global leaderboards [37].

- **Rewards**. They are given as a recompense based on time or after a certain number of actions/tasks are completed [24] or as bonuses [8]. These prizes could be virtual or real, but they are better in multiple small prizes than in one big prize [38]. It is highly important to have a scheduler to distribute them along the full course (regular and consistency delivery) [24, 38]. Rewards are considered as feedback [30], motivating, funny and encouraging for the students [25, 26, 38].

- **Avatars**. Graphical designs for students. It helps to the visual status and social engagement. For a better effect, it is recommended to enable personalization and upgrade features (based on skill, as a reward, on progression, among others) [30].

- **Progress Bar**. This element helps on a constantly feedback and information on progression of learning objectives [24, 26, 37].

Finally, although learning contents are not gamification elements, careful attention should be paid to them. They should be linked to the "*Cascading Information Principle*" [8, 24], which requires that the course contents need to be divided into small pieces of information, with optional resources, regular activities/tasks and in-advance information on following contents.

III. GAMIFIED PLATFORM DEVELOPED

In this section the social features of the developed platform are shown. Then the gamification elements that were implemented on the platform are explained.

The Elgg platform [45] is used as baseline for the gamification elements. It is an open source engine, launched in 2008, made to create social networks. It is a web framework written in PHP and MySQL. It was selected, apart from being an open source tool, since Elgg is known for being the first platform to line up social networking elements with educational environments.

This platform was deployed as a MOOC course for undergraduate students. Nevertheless, this paper will not focus on these results, since it is expected to perform more tests with students.

A. Social Features

Social networks are working to become an improving and enhancer tool for the students [46-49]. The features indicated in this subsection are the core of the Elgg engine, since the gamification elements are built upon these features.

1) Friends

This feature makes possible for the students to establish bidirectional relationships between the other members of the course. Building relationships between students is considered highly motivating [50].

2) Activity

This feature includes, in the main page of the system, a list of recent events accomplished by the students within the course (Fig. 1). It provides a sense of recognition to the activities were students are involved.
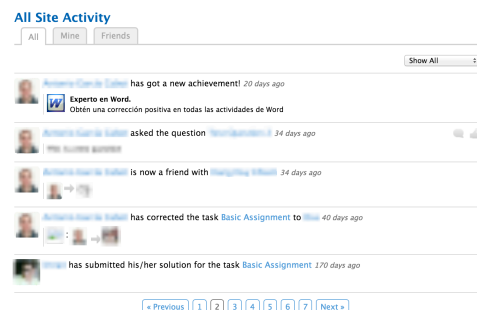

Fig. 1. Example of the site activity section.

3) Blog, Questions and "The Wire"

With the Blog functionality enables creating individual publications on the system, while within the Questions section, it is possible for the students to submit their questions to the

platform, in order to be answered by the teachers or even by other students.

"The Wire" is a feature that adds a micro-blogging (messages of 140 characters or less) section to the system, which is shown as a very helpful tool for learning [51]. The only drawback could be the information overload [51], because the high number of messages.

B. Elements of Gamification

Adding gamification elements to a socialized environment increments the engagement of students, even making them more active [52]. The chosen elements were: Points, Achievements, Leaderboards and Rewards. As shown in previous sections, points are selected because they are the baseline for other gamification elements [37] and promote motivation, feedback and success [30, 38-40]. In this context, points are given to the student when they complete tasks or when they are rewarded with achievements. Achievements and Leaderboards, apart from being visual and social elements, help on motivating the student. Finally, rewards were selected to maintain motivation and encouragement of the students along the course.

Although the system presents a profile image, it cannot be labeled as avatar since there are no upgrade options. Likewise, since Learning Contents are planned to be presented in a parallel way, there is not availability to include levels or progress bars as elements.

1) Tasks with Points

A list with the assignments of the course is shown (Fig. 2). Each task presents introductory information about what students have to do to finish the task and (optionally) a series of additional files.
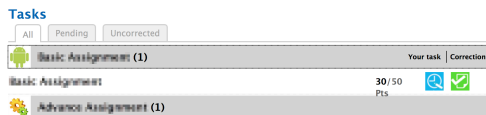

Fig. 2. Example of available tasks.

This section includes peer-review. When a student submits an assignment, he/she is eligible to evaluate a randomly assigned assignment submitted by another classmate (Fig. 3).

Points are given for submitting the assignment, for peer-review and for receiving positive assessments on her assignments.
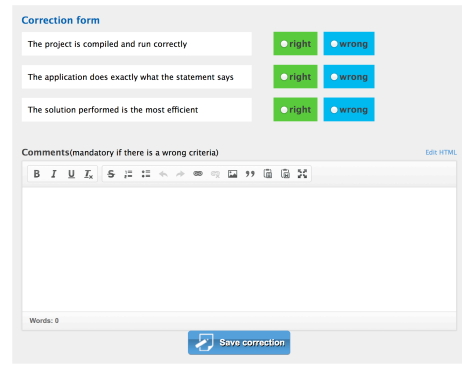

Fig. 3. Detail for a peer-review.

2) Achievements

Achievements are given in reward for accomplishing certain course activities (Fig. 4). When a student receives an achievement, he/she is also rewarded with some extra points.

As they are rewards (both for completing activities [24] and as bonuses [8]), an scheduler is required [24, 38], so they are planned to be given gradually along the course.
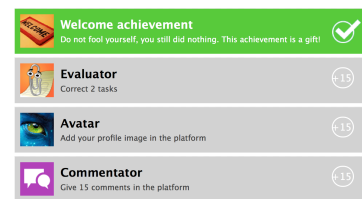

Fig. 4. Example of achievements.

3) Leaderboard

User leaderboards are divided into four types (tabs): points, friends, comments and tweets. The "Points" tab (Fig. 5) shows the points got by every user over the course and the rewarded achievements. The "Friends" tab (Fig. 6) shows the number of friends made by each student (i.e., number of follows). The "Comments" tab (Fig. 7) shows the number of comments written by each user on the platform. Finally, the "Tweets" tab (Fig. 8) shows the number of micro blogging entries in "The Wire" section.

Fig. 5. Details of the leaderboard: Points section.

Fig. 6. Details of the leaderboard: Friends section.

Fig. 7. Details of the leaderboard: Comments section.

Fig. 8. Details of the leaderboard: Tweets section.

4) Rewards

The "Store" section is where the students are able to exchange their points for some extra rewards (Fig. 9). The available items are "*extra score*" (0.20 extra score in the final grade, can be purchased up to five times), "*image in profile*" (a background image in the users' profile) and "*custom notifications*" (a background image in the activity section). Redeemed points are deducted from the user's account, but remain for the leaderboards.

Fig. 9. Details of the store section.

IV. CONCLUSIONS

In this paper, we have presented a social platform (Elgg) in which we have developed a gamified plugin with the following elements: points, achievements, leaderboards and rewards. All these elements have proved in several studies to encourage engagement and motivation, and this platform has been successfully used in traditional e-learning environments, helping students to improve their grades. Therefore, we expect this platform will increase motivation of students and help to reduce dropout rate in MOOCs. To test this, we are planning experiments with students in real MOOCs, and we will compare the results against those obtained in control groups (i.e. using a non-gamified platform) to verify their effectiveness.

We are also planning to include other additional gamification elements such as badges (e.g. Mozilla Open Badges) because they may increase even more the motivation of students, since they remain after the course has finished and can be accessed over time anytime. This way, students can have recognition of passing a course that they can use in their curricula vitae for proving their skills.

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