

Can gamification be effective in combating dropout in higher education?

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Abstract - Engineering higher education schools are facing a major challenge to keep students motivated and involved in the curriculum, especially in math disciplines. In this work we describe our experience with gamification, which we define as a technique that uses elements of games outside games context, in this case in teaching higher education. We present a treatment of the data obtained in the last years where we can compare the results obtained in the same discipline in years in which the gamification was used with the results obtained in years in which the gamification was not used. We found that gamification correlates with an increase in the percentage of approved students, with the presence and participation in the classes and with the participation in volunteer activities. The game also seems to promote interaction in the classroom and get students to pay more attention to the course. We also observed positive student assessments and volunteer testimonials on the gamification experiment in math classes.

Keywords - Experience, gamification, higher education.

INTRODUCTION

Today we talk a lot about gamification. According to Espíndola (Espíndola, 2014) gamification is the use of mechanics and game dynamics to engage people, solve problems and improve learning, motivating actions and behaviors in environments outside the context of games. But in education, this is not easy to apply, for example, giving students points can increase competition and encourage them to study more, but it can also decrease their intrinsic motivation. The wide range of game elements available and the contradictory evidence on the use of gamification in higher education can make this task a challenging task.

Many papers reporting experiences with gamification have appeared in recent years. According to Dicheva, most papers report encouraging results from the experiments, including a significantly greater involvement of students in forums, projects and other learning activities (Dicheva et al., 2015). An example of a work in a Linear Algebra course is presented by Pedro Santos (Santos, 2015).

We set out to investigate the following question: Can gamification be effective in combating dropout in math subjects in the 1st year of engineering degree?

To answer this question, we conducted a gamification experience in a first year and first semester discipline of an engineering degree. In this extended abstract, due to the space constraint, we make only a brief presentation of the methodology used, present the results in the final work, and present some conclusions as well.

METHODOLOGY

We have applied gamification in Linear Algebra and Analytic Geometry, which is one subject of the first year and first semester of a degree in engineering. The number of students enrolled in the discipline where we using gamification were 271, of which over 83% have attended the discipline into the end of the semester. Towards answering our main question, we use passing ratios, participation counts, and results of evaluation surveys to quantify the effectiveness of using gamification in teaching our courses. Although we agree that gamification cannot solve the intrinsic problems of curricular units, we find that it can lead to better course experience for the students and to better overall course outcomes.

At the beginning of the semester, 100 starting points were awarded to each student. During the semester, the students had to perform various tasks, some compulsory and others optional. All tasks were scored, and if students did not do a mandatory task, they would lose points. In addition to the points students received for performing tasks, they could also take medals or bombs. The medals were rewards attributed to students for certain tasks, such as participating in forums, solving challenges, among others. Obtaining a medal rewarded the student with a predetermined amount of points. The bombs were punishments attributed to students for not performing certain tasks required as homework, Moodle tests, among others. Bombs penalized students by taking a predetermined number of points. So, everything the students did or did not do, gave them or took points. The tasks to be performed during the semester were: Individual summative tests, bi-weekly test on Moodle, which could be done individually or in a group, forums and challenges, the

challenges were real-life problems that needed the mathematical concepts that were being addressed in this discipline. There was also a weekly task list, which was posted on the course page in Moodle, and where the students have the indication of which tasks were mandatory and which were optional and how much points each student could gain from these tasks.

At the end of the semester the points were converted into a grade and every hundred points corresponded to a level and there were twenty levels corresponding to grades from zero to twenty. At the end of the semester a questionnaire was passed to gauge how the students evaluated the gamification experience. The questionnaire had six closed-ended and one open-ended questions where each student was asked to identify what were in their opinion the positive and negative aspects of the gamification experience they had made. This questionnaire was facultative and anonymous. Most of the students answered the questionnaire and although they pointed out some less positive points, all those who responded evaluated positively the experience.

RESULTS

In this study, the sample was the set of all students enrolled in the first year and first semester of this engineering course. Over the past few years, the assessment has been changing. In school year 11-12, the evaluation was only by final exam. From 12-13, the evaluation began to have a component that was made in Moodle. In 12-13 it was optional, in 13-14 it was already mandatory, but the part that was made in Moodle was only composed by multiple choice tests. In 14-15 and 15-16, in addition to the multiple-choice tests there were discussion forums. In 16-17 the challenges were added and in 17-18 the evaluation followed the methodology described in the previous point. As can be seen from the graph, figure 1, the mean of the evaluations increased as more gamification elements were introduced, and the standard deviation was decreasing.

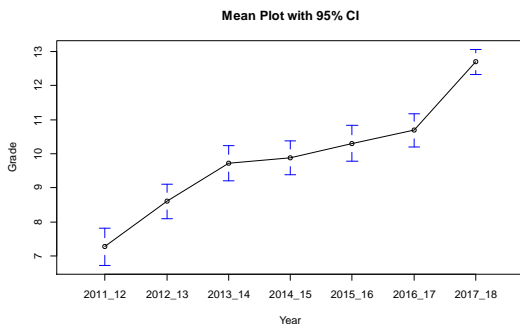


Figure 1 – Data obtained in the last years

This difference can be better observed in the graph presented in figure 2, where we can compare the data obtained in the school year in which the traditional evaluation was used with the data obtained in the school year in which the gamification was used.

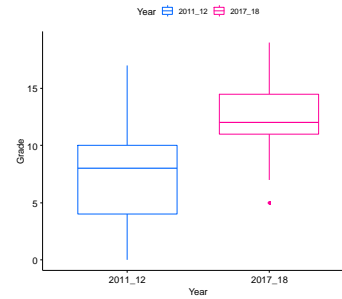


Figure 2– Data obtained with and without gamification

CONCLUSIONS

Responding to a growing need to find new ways to motivate first year students, we proposed in this work to use gamification to improve student participation and success and to combat dropout. We found that gamification can help our students in many ways, from increased passing and participation rates, to high student satisfaction. But also, that the gamification can be a factor to demotivate the students so we must be careful when using gamification in teaching.

At the end of the semester we can see that the dropout rate was low, and the students were very involved in the classes and in the activities of the curricular unit. These facts may indicate that the impact of gamification on learning has been successful.

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