

## GAMIFICATION IN HIGHER EDUCATION: A CASE STUDY

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### **Abstract:**

In this paper authors present a simple didactic experiment of implementing several gamification techniques into didactic process at one of the courses of Computer Science at the technical university. The results of the experiment – which lasted for a whole semester - are presented and discussed on a basis of a case study of 62 students of the first year of Master's studies, who were divided into four different groups. Two of those groups were gamified using simple techniques such as points, leaderboards and badges, while the rest followed the traditional academic grading system. After the whole semester the results of all groups – attendance, number of additional tasks completed, the grade average and so on were collected and analysed. Authors are trying to determine if gamification can improve the students engagement and quality of learning (and by doing so, have a positive impact on their marks) or is just an *en vogue* notion with no practical application.

*Keywords: gamification, higher education, didactics methods, didactics*

## 1. INTRODUCTION

By definition, gamification means using the mechanics, rules and techniques known from various kinds of games (including board games, role-playing or computer games) in non-gaming context to increase user's engagement in performing various types of activities, especially if those activities are considered boring or routine (Deterding et al., 2011). This notion is used for improving both the users' engagement and their experience.

Although the notion of gamification appeared in the middle of last decade (Tkaczyk, 2012), the idea itself isn't new – for example, usage of games for researching human mind and behavioural mechanisms is widespread in psychology. Moreover, the researchers point out that the whole idea may have truly international roots: it may derive both from Soviet socialist work competition and motivational techniques used in American corporations in the 1990s (Deterding et al., 2011; Nelson, 2012).

The problem of engaging students in a didactic process is an old issue. When gamification was developed, some teachers seen it as a remedy (Huotari&Hamari, 2012) for a low students' engagement problem. On the other hand, others claim that gamification has to be carefully planned (Sheldon, 2011; Huotari&Hamari, 2012) and considered before being implemented into any process.

## 2. EXPERIMENT BACKGROUND AND SETTING

### 2.1. Research problems

Authors wanted to answer the following questions:

- 1) Does gamification improve or downgrade students' engagement and performance in class?
- 2) Which of gamification techniques has the biggest influence on students and why?

In order to answer those questions an experiment was proposed and conducted.

### 2.2. Experiment background

The experiment included 62 students of the first year of Master's studies in Computer Science. The gamified course was Service-Oriented Architecture.

The aforementioned students were chosen mainly due to two factors:

- 1) the majority of students didn't know each other before the start of the semester, which allowed research on teamwork;
- 2) as students of Master's studies, all of the students had previous academic experience and the same level of basic knowledge from Bachelor's or Engineer's studies. This allowed authors to assume that all of the students do know the rules and proprieties of the study path.

### 2.3. Experiment setting

Due to the limitations of the computer laboratory room, the students were divided into four different groups. Two of those groups (31 persons in total) were gamified, while the other two (also 31 students in total) followed the traditional academic study path and didactic methods.

The used gamification mechanisms included the traditional approach: points, badges and leaderboards. Students were supposed to gain points for every action taken during classes (see Table 1 for details): attending classes, doing homework, taking bonus tasks and, finally, completing a project. Each project could be done two-fold: in a basic or extended way. The extended version of the project covered all the problems from the basic version and several additional, more difficult issues to be solved. Completing the basic version of the project was mandatory, although students could decide to complete the extended version.

After completion of certain actions (e.g. finding a bug in teaching materials) students could gain additional points or bonuses (e.g. +10% to the final score) – see Table 2 for details. Names for those opportunities were derived from the internet meme culture.

Grading marks were divided into seven levels, each representing a different mark, e.g. reaching by the end of semester level 1 resulted in 2 (fail), while reaching level 7 resulted in 5 (the top mark). The grades and percentage threshold are shown in Table 3.

There was also one limitation to the students – all of them (both gamified and non-gamified) were allowed to have only two absences. The higher number of unjustified absences resulted in automatic failure.

**Table 1:** Points assignment for the gamified groups

Description	Points	Occurrences	Max. number of points to gain
Attending classes	25	10	250
Completing a basic project	80	1	80
Completing an extended project	80+70	1	80+70
Homework (theoretical)	100	3	300
Homework (practical)	100	3	300
Test	30	2	60

Source: own work.

**Table 2:** Additional tasks and point gaining opportunities

Name	Condition	Result
Not bad	For a person who – during classes – surprised the lecturer in a positive way	+1% to total score
Freddie Mercury	For a person who gained 100% on a test or For a person who has 0 absences during the whole semester	+5% to total score for each condition
Disinfester	For a person who spotted and corrected a bug in the code provided by the lecturer	+50 points
Watch out!	For a person who spotted and corrected a bug in the instruction provided by the lecturer	+25 points
Smart guy	For a person providing a 'How-to' instruction to his/her project	x2 points for the project

Source: own work.

**Table 3:** Percentage thresholds (“levels”) for grades

Level	Points	Grade	Equivalent	Result
7	>=1000	5.0	A	Pass
6	900-999	4.5	B	Pass
5	775-899	4	C	Pass
4	650-774	3.5	D	Pass
3	500-649	3	E	Pass
2	1-499	2	F	Fail
1	0	unclassified	unclassified	Fail

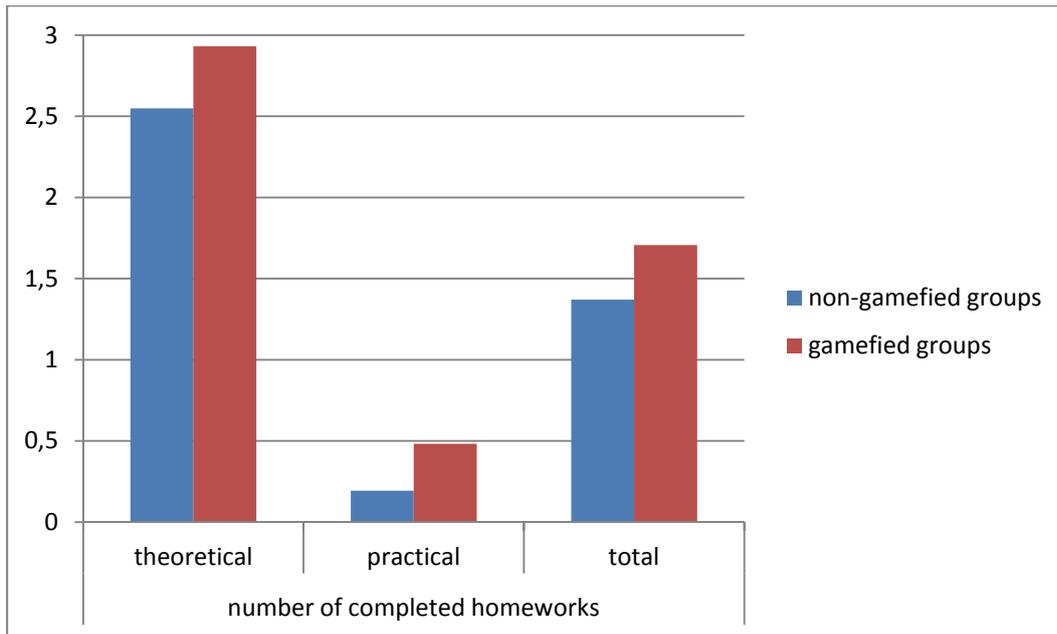
Source: own work.

### 3. RESULTS

The results from the experiments were surprising:

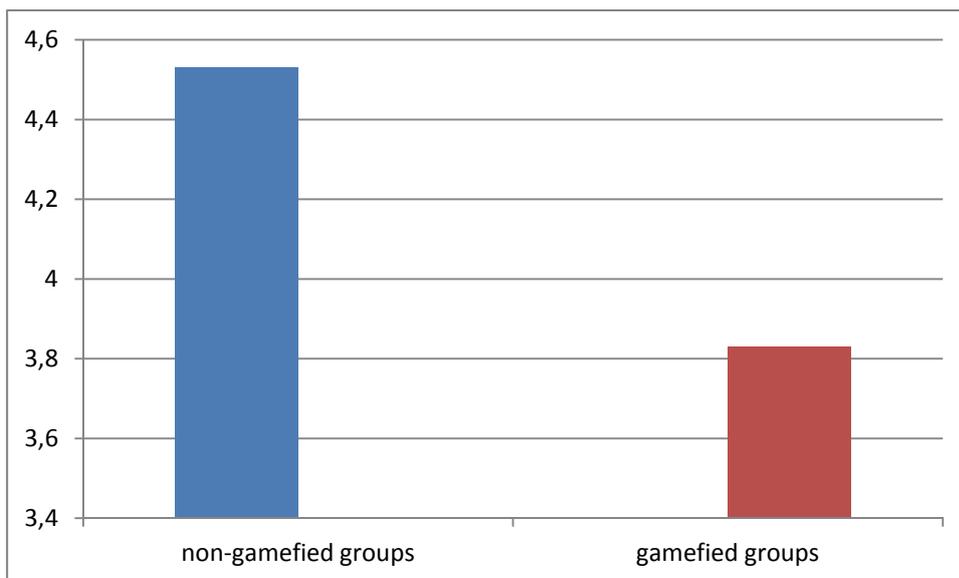
- gamified groups were characterized with higher attendance level (over 97%) than regular groups (over 85%),
- the gamified groups completed higher number of homework per person (1,7) than non-gamified ones (1,37). The number of completed homework is although pretty low, since there were 6 pieces of homework in total (see Chart 1 for details)
- the average mark in both gamified groups was 3,83 (on a scale from 2 to 5), while in non-gamified groups the average final mark was 4,53.

**Chart 1:** Number of homework completed



Source: own work.

**Chart 2:** Average grade



## 4. CONCLUSIONS

The experiment showed promising results. Elements of gamification may be implemented into learning process, as they seem to have positive impact on at least some factors, like class attendance. However, authors could not find a correlation between higher class attendance and lower grades received by the gamified group.

The experiment should be extended for larger group to examine students' attitude before and after course, as well as if students tend to compete between each other. The task of assigning certain points for every task and balancing them wasn't easy and may be corrected to every new course which is being gamified.

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