

Correlation of gamification usage during class in the same student generation with different course field and year of study

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Abstract

With the development of new technologies, the roles of students and professors have changed dramatically. Today, everyone is exposed to information overload and has the ability to find specific information in the matter of seconds. Therefore, it has become challenging for students to sit silently for the entire lecture and consume information given to them. Also, it is challenging for professors as well. Since students have the opportunity to learn everything through the Internet, professors ask themselves how to keep the lecture interesting and exciting for students of the new technology generation. For this reason, new and innovative methods of teaching must nowadays be present in the education process in order to motivate students to be active in class. One of those methods is called gamification. This paper analyzes usage of the gamification tool Kahoot on the undergraduate program of Zagreb School of Economics and Management (ZSEM). Special emphasis of research goes to analyzing the same group of students in gamification on different course fields and years of study in order to see correlations between old and new Kahoot results. Students were part of gamification in the 1st semester on course Information and Communication Technologies (ICT) and 4th semester on Principles of Commercial Law (PCL). Research shows that students are very satisfied with gamification, regardless of the course field and study year.

Keywords: *Gamification, Education, Teaching methods, Information technologies*

1. Introduction

The rapid development of information technologies not only offers numerous possibilities of improvement in higher education, but also alters the role of students and professors today. As students are exposed to information overload through technology, it has become challenging for them to sit for a longer period of time and being forced to listen and consume more information during classical, *ex cathedra* lecturing. The traditional method of teaching is not interesting enough anymore for the new generations and higher education institutions are aware of it. Professors need to pursue new teaching methods enabled by technology that keep the class both educational and entertaining, enable interaction and lift students' motivation. One of those methods is called gamification [1]-[5]. A gamification tool, named Kahoot, is used in class in order to check students' knowledge and to support continuous learning. Additionally, this educational tool can also be part of e-learning [6, 7].

In the paper titled „Influence of gamification on student engagement in education“ [8], authors state that there is no connectivity between the Kahoot games, meaning that students are not discouraged if they have not prepared for one quiz as they can still have excellent results in the next game. Also, students that have a high final grade at the end of the semester, usually have better scores and standings overall in Kahoot games.

In another paper, “Influence of gamification on student motivation in the educational process in courses of different fields” [9], authors have shown that there is no difference - in terms of student motivation and satisfaction - between IT and law courses in using gamification teaching method. In this paper, only one student group was part of the gamification process in a certain time period - first course that used gamification was a part of Information and Communication Technologies (ICT) course which is taught in the first semester, and the

second was Principles of commercial law (PCL) which is taught in the fourth semester at Zagreb School of Economics and Management (ZSEM). The student sample is the same – meaning that the results have depth as part of students' individual experience throughout the years of study with the gamification teaching method.

The aim of this paper is to explain how gamification was used on ZSEM and what were the results based on student perspective research and correlation analysis of the Kahoot games between the students on both of the mentioned courses.

2. Gamification on ZSEM

ZSEM started in 2002 and since that time it has implemented best practices concerning processes in quality management, standardization [10] and also, new technologies in education [11, 12]. Some of the professors on ZSEM already started using gamification in 2011, however, the gamification with Kahoot started since 2016. [9]

So far, gamification research on ZSEM has proven to be mostly positive as students do accept the new teaching method and think of it as encouragement for better motivation towards learning and, eventually, earning a better final grade. However, the interest lies in the question: can gamification sustain its beneficial and fun teaching dynamic if it is used too often? Because of this, the research was conducted upon one student group in order to see the influence of the gamification teaching method throughout the years of study of the same generation provide insights into education via gamification tools topics such as: does the motivation and satisfaction remain the same, how does it reflect their grade continuously throughout the education and years of study, etc.

2.1. Gamification on ICT

ICT course is an obligatory course for first-year students in the Economics and Management undergraduate study program at ZSEM. The course is taught within one 15-week semester in the 1st semester. Students attend the course for four hours per week: two-hour lectures and two-hour of practical computer lab work.

ICT aims to teach students how to use new technologies and how to adapt in today's digitalized and globalized world. The course has a very developed e-learning component so students are adjusted to using new technologies, either in class or in the form of asynchronous distance learning [13].

Kahoot is used for repetitive learning and for exam preparations. The quiz is assembled from 7 to 10 questions, and for each question there is a 20 seconds time limit to answer. Kahoot counts accuracy, as well as speed of answering the question. Activity in gamification is not a necessary part to form a grade, but it provides extra percentage which depends on students' Kahoot placement order. In Table 1, it is visible that the first place is awarded with 1.5%, and students that were from 2nd to 5th place are awarded with 1%. The rest of the students get a symbolical award of 0.5% for participating in the Kahoot game. [9]

Kahoot placement	Extra percentage award system
1 st place	1.5%
2 nd – 5 th place	1%
Symbolical activity award	0.5%

Table 1. Kahoot award system on ICT

2.2. Gamification on PCL

The Principles of commercial law (PCL) is an obligatory course for second-year students in the Economics and Management undergraduate study program at ZSEM. The course is taught within one 15-week semester in the 4th semester. Students attend the course for three hours per week: two-hour lectures and one-hour of practical teaching.

The goal of this course is to introduce the students with the basic notions and principles of corporate and company law and commercial contracts. This course is a necessity for proper understanding of different legal issues as well as the modules how modern economies operate nowadays. It is foreseen that the knowledge provided in this course should be easily applicable in practice. The course integrates two legal fields: company law and the law of commercial contracts. In the segment of company law, the students learn procedures of setting up and managing corporations and other commercial entities. In the segment of the law of commercial contracts, the students learn about the major contractual principles and forms, especially those that are of immense importance while conducting commercial activity on the market. The main objective of the course is to raise students' awareness of the impact of legal rules and their importance for the daily operations of entrepreneurs and companies. Special emphasis is placed on the fact that the legal system within which they operate their businesses makes up the macroeconomic environment and as such has a direct effect on the business process and results of operations. That is why students should be familiar with the regulations and legal requirements which they will apply in their future work and possible issues that can occur related to them.

The lecturer used Kahoot during the practical teaching in order to measure the knowledge of students on a specific course-related topic discussed that week and award points for additional activities. Student could earn as much as six percent of the total grade via their success in Kahoot. The grade elements are provided in Table 2.

Principles of commercial law grade element	Percentage in grade total
Class attendance	4%
Activity	6%
Mid-term exam	40%
Final exam	40%
Term paper or presentation	10%
TOTAL	100%

Table 2. Principles of commercial law grade elements

During each Kahoot session, only the top half of participating students were rewarded one percentage point for activity points, while the winner was awarded two percentages for activity points. The rules about using Kahoot and how they could earn activities percentage points were stated to the students before each Kahoot. Participation in the Kahoot quizzes was not obligatory for students. Students participated in Kahoots individually.

In total, there were six Kahoot sessions during the 15 weeks of course provision. Students participated in at least one Kahoot quiz. Each quiz had twelve questions and students could provide an answer within 30 seconds (questions with only correct/incorrect answers were also set to 30 seconds for providing an answer).

3. Research results

As gamification was part of both courses, on ICT and PCL for the same student group, the correlation analysis was conducted only for students that had at least one gamification participation on both courses – creating a sample of 47 students. Out of the mentioned sample, students were asked to participate in the gamification survey in order to receive their perception and feedback regarding gamification in class. ICT survey had a sample of 41 students with a small majority of female students (58%), while PCL had a sample of 29 students, but also 58% of the sample were female students. Two survey questions were analyzed to examine students' interest towards gamification in class – regarding satisfaction and motivation. The other part of the research was the correlation analysis of student answers and ratings after all quizzes within the semester for both courses – trying to determine how does the success from 1st year of study in gamification reflects with the success from 2nd year of study with the same student group.

3.1. Student satisfaction

The same student group filled the survey after gamification process on both courses regarding their satisfaction. In ICT, over 90% of students graded their satisfaction level with a grade of 4 or 5 in the survey, while in PCL 89% gave a high grade of 4 or 5. The average of students' satisfaction in ICT is 4.6, but with median and mode function the result was a clear 5. In PCL, students' average score was 4.5 with also highest median and mode – 5. The results show students high satisfaction level when using a new teaching method in class.

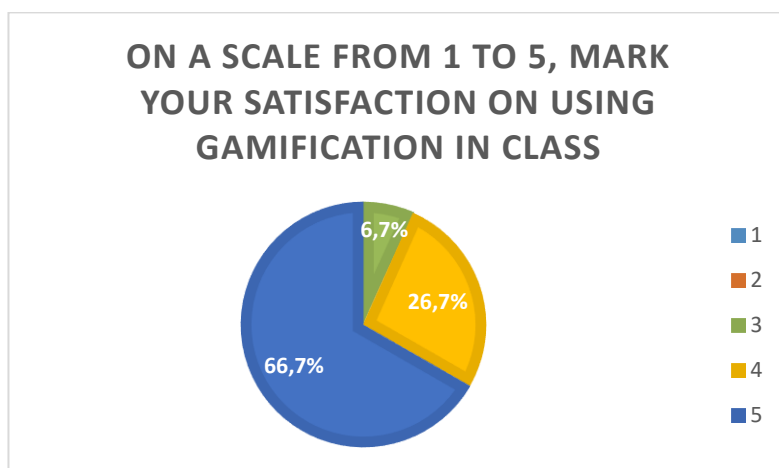


Figure 1. ICT student satisfaction

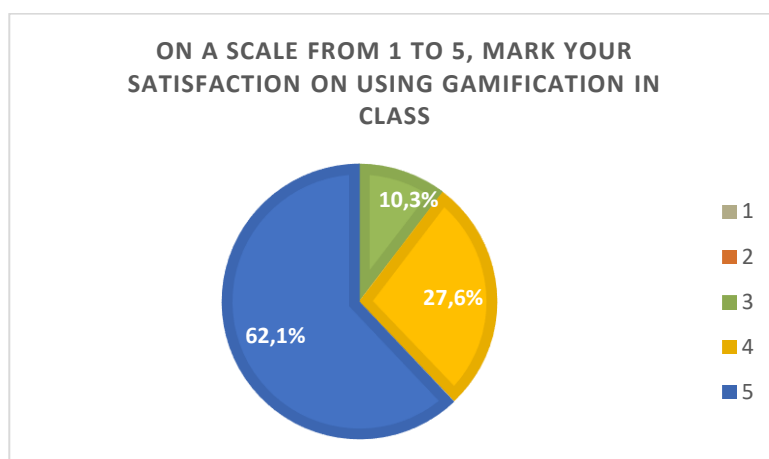


Figure 2. PCL student satisfaction

3.2. Student motivation

The students were also asked in the survey to rate how much gamification has helped them to progress during the semester - in terms of motivation. The results of student motivation in class is high as the results of satisfaction level. In ICT, 93% of students believe that gamification is helping their motivation by grading with a 4 or 5. The average grade in ICT is 4.4, while median and mode functions are the highest grade, 5. For PCL, the scores are also high, however, lower than the scores students gave for ICT when they attended it in the academic year of 2016/17. The average grade of students' motivation perception is 4.2, with a median of 4, while mod is a grade of 5.

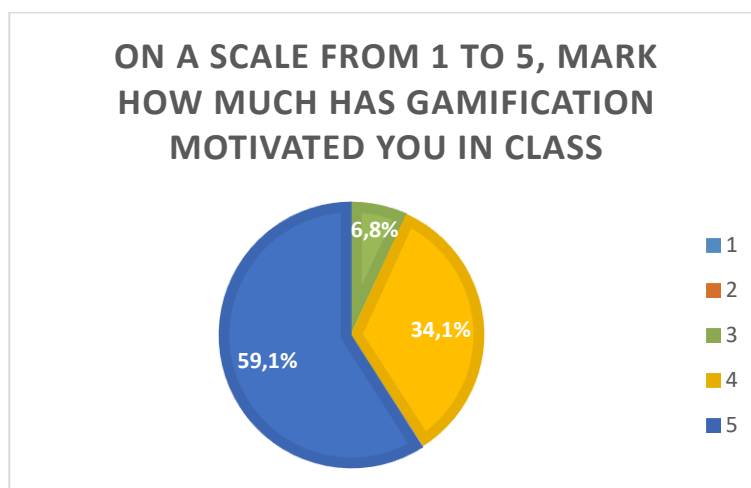


Figure 3. ICT student motivation

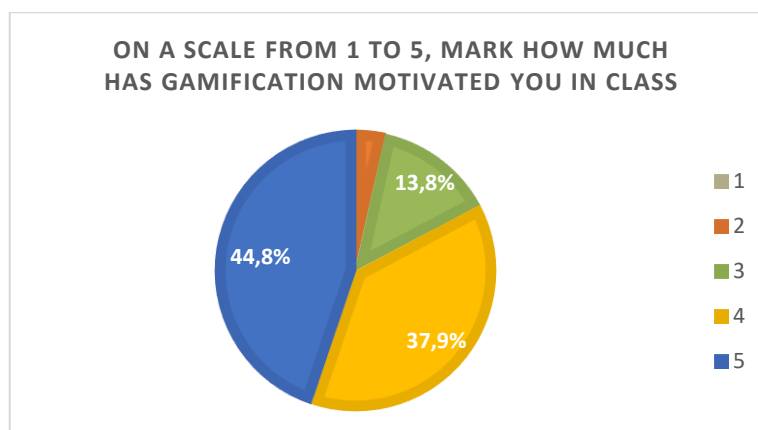


Figure 4. PCL student motivation

3.3. Correlation analysis

ICT and PCL Kahoot results were analyzed in order to identify the correlation of students' scores and rankings on different course fields and years of study. The correlation was based on the absolute value and relative value of both Kahoot data sets.

Absolute value is the result gained on a Kahoot quiz depended on correct answers and time used to answer the question as the program generates the values of the score. The correlation of ICT and PCL absolute values is 0.56. Relative value is the final ranking among students based on placement earned after each Kahoot game –

the rankings of the students were set from absolute values. The correlation of ICT and PCL relative value is 0.58. As correlation of both cases is similar in values, only relative values will be used in further analysis.

A scatterplot was created in order to display the relationship of ICT and PCL relative values. Figure 5 shows that students are either well positioned on both courses, or very bad, there are only couple of dots that are a stand-alone with no correlation. This means that it is mostly about the students and their individual engagement – they either care or don't about the knowledge and final grade.

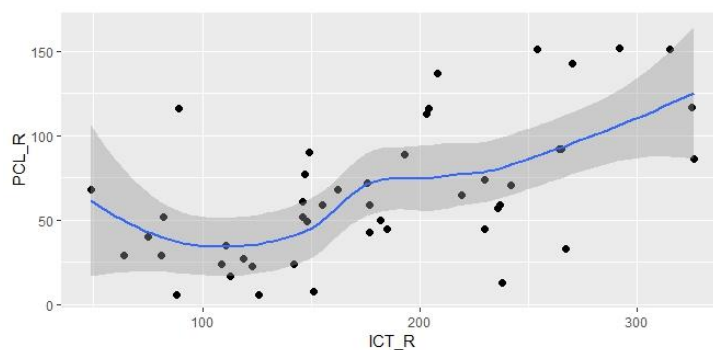


Figure 5. Scatterplot of ICT and PCL relative values

In order to examine the data set more detailed, the set was separated on male and female students. In Figure 6 it is visible how female students really follow the mentioned theory how there is a correlation between high standings in both of the courses, or low. However, male students are more scattered and it does not necessarily mean that if a student is good at one course, that it will have good results on the other course as well.

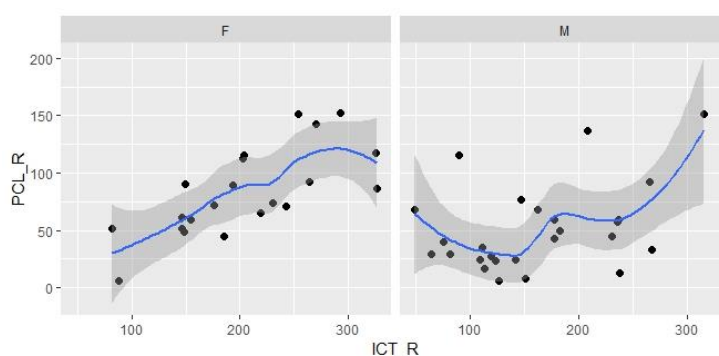


Figure 6. Scatterplot of ICT and PCL relative values of male and female students separated

As the scatterplot showed the difference between female and male students, additional tables and graphs are provided to enrich the research. In Figure 7, a table for boxplot is presented in order to see the difference between minimum, median, mode, maximum, 1st and 3rd quartile values. The difference is based on number of students in participation on Moodle on both courses.

	ICT Relative value	PCL Relative value
Minimum	49,0	6,0
1st Quartile	124,5	34,0
Median	177,0	59,0
Mean	180,6	65,6
3rd Quartile	236,5	89,5
Maximum	326,0	152,0

Table 7. Statistics of ICT and PCL relative values for boxplot

The correlation of both courses in relative value (or absolute) is low as the maximum standing number and minimum are different. However, it was interesting to see the difference between genders in both of the courses separately. Figure 8 and 9 provide a histogram and boxplot of both ICT and PCL. In ICT, most of the better standings are taken by female students as it can be seen in both of the graphs. However, PCL boxplot shows a big difference in relative values as female students are better than male students - maximum value of male students is lower than median of female students.



Figure 8. ICT relative values: histogram and boxplot



Figure 9. PCL relative values: histogram and boxplot

4. Conclusion

The aim of this paper is to show the impact of the new teaching method gamification in higher education. The research and Kahoot quizzes were conducted on one student group while they were on 1st year of study and 2nd year of study – and the courses that supported gamification were of different field. This study has found that generally the satisfaction of students using gamification is high, however, the motivation drops as they get older. A possible explanation for these results may be that students want to use new tools that enforce gamification in order to keep the interest in the new teaching method. Also, the correlation of Kahoot answers between the two evaluated courses is positively moderate, which means that students who had excellent results on one course had higher scores in the other course as well – and vice versa. Also, female students have better overall scores and standings in both courses – ICT and PCL.

A further study could assess new gamification methods and tools which should be tested in order to determine the best approaches to enhance student motivation and satisfaction. Also, it would be interesting to undertake gamification research on the same group for the whole undergraduate study period of economics and management at ZSEM – meaning two more years so the results of research have a deeper meaning.

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