Influence of Gamification Reward System on Student Motivation

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***Abstract* - In the last couple of years, gamification has been increasingly used in education in order to motivate and encourage student engagement and interaction in class lectures, but also E-learning. In this paper, gamification usage is analyzed through online tool called Kahoot that has been used on the Information and Communication Technologies (ICT), a course that is part of the 1st semester on Undergraduate program on Zagreb School of Economics and Management (ZSEM). Two student groups were analyzed – ICT course held in Croatian and ICT course held in English. Based on the overall semester score in Kahoot, students from Croatian ICT course were awarded with extra percentages as a reward for their activity and engagement in class. In the English ICT course, which is by the program and syllabus equal to Croatian ICT course, students were not rewarded with extra percentages as gamification was only perceived as a knowledge revise tool during the semester. Another difference between the groups is the diversity in the English ICT course, as there were also international exchange students mixed with the enrolled ZSEM students on English program. The paper presents analysis of extrinsic and intrinsic student motivation from both groups and provides correlation analysis of gamification results with students' final grade and survey elements regarding student motivation perception and the importance of receiving a reward after the game.**

Keywords – Gamification, motivation, reward system, education, information and communication technologies

I. INTRODUCTION

According to Deterding [1] gamification is using game design elements in non-game context. [2, 3] One of the most widespread areas of gamification application is education. Over the past 10 years, gamification has been intensively used in education to motivate students to be more active in class. [4, 5, 6] In the paper "The model for introduction of gamification into e-learning in higher education", authors described the great possibilities of using gamification not only in the classrooms, but also in the field of E-learning. [7] By using gamification, teachers are closer to students, students are motivated to learn through fun by staying focused for a longer period of time.

With the development of smart phones, a number of applications have been developed that enable gamification in education – which is easily accessible for students and lecturers. [8, 9, 10] This paper will use a very widespread and user friendly game-based learning platform – Kahoot. [11, 12]

In the paper "Influence of Gaming on Student Motivation in the Educational Process in the Courses of Different Fields" the authors analyzed the use of Kahoot on the same student sample – however, the courses were of different areas, such as technologies and legal discipline. [13] Results have shown that students are highly motivated to learn through Kahoot whether it is a course directly related to new technologies such as ICT (Information and Communication Technologies) or social subjects such as legal courses. [14]

According to Honey & Mumford, there are four main pillars related to gamification: the elements of the game, the motivation, the rewards and the adaptation to the users' profile. [15]

Gamification is closely related to intrinsic motivation and it presents 4th motive on Glasser's list of motives [16, 3], students are keener on playing and competing if there is some kind of a symbolic award. [14] Depending on the content, gamification uses different reward mechanisms, but the most common ones are: Leaderboards, Prizes and Achievement. [17]

In the paper, "The role of competition and reward regarding student motivation in the gamification process of different age groups", the authors analyzed student motivation in gamification and their perception regarding rewards – depending on the age group [18]. The analysis was based on the sample from first year students, fourth year students and lifelong learning student group. All of the students were motivated with Kahoot, however, older students are more intrinsically motivated and are more focused on their progress, while younger students have more interest in the competition with peers and are more willing in gaining some sort of reward.

This paper is constructed into four main parts: Gamification on ZSEM, Research Methodology, Student Perceptions, Research Results and Conclusion. The paper first explains the usage of gamification on ZSEM and the methodologies used in order to evaluate gamification impact on students. The following part of the paper focuses on the research results and its analysis for conclusion interpretation.

II. GAMIFICATION IN CLASS ON ZSEM

A. Gamification on ICT course

ICT course is about teaching students how to use new technologies and how to deal with certain changes within the appropriate time frame. That is why gamification is very suitable for this type of class as it uses modern technology for learning – such as Kahoot. Kahoot is used for repetitive learning and exam preparations. [13]

For this research, two ICT groups of students were analysed – Croatian group and English group, meaning that there was one group held in Croatian language to ZSEM full time students, while other group was held in an English language. The English group had some of ZSEM full time students which took the English program and also, some of international Exchange students who enrolled the ICT in English, making the group full of diversity and different cultural dynamics.

Students that were part of the Croatian group were told at the beginning of the semester that they will be rewarded depending on their gamification Kahoot scores, while the other, English group were told that gamification was only used as a revise learning tool – no rewards based on scores. Moreover, the Croatian group were also awarded for if they contributed to this research with a filled survey, while English group of students were only ask to help and contribute.

B. ICT Croatian group

As mentioned, ICT Croatian group had a certain reward system based on Kahoot scores. In Table I, it is visible that first place is awarded with 1.5%, and students that were from 2nd – 5th place are awarded with 1%. The rest of the students get a symbolic award of 0.5% for participating in the Kahoot game.

TABLE I. KAHOOT AWARD SYSTEM ON ICT FOR CROATIAN GROUP

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

C. ICT English group

As it has already been clarified, the English ICT group did not earn any rewards during the semester as they were informed that gamification is used only as a revise lecture tool. This was made in order to determine how motivation was built in this way and if any, what kind of a motivation was it and how they can be compered – intrinsic and extrinsic.

The diversity in the group was also promising as the background of the group is more dynamic – however, it may also influence the research results drastically.

III. RESEARCH METHODOLOGY

The research was based on student survey results and Kahoot results, where one of the variables are personal student perception regarding gamification and another being real measurable student quiz results.

The goal is to explore student perception and the influences regarding motivation in class. By questioning, measuring and analyzing the relationship of the received results, the insight into student motivation can be measured and class intensity adapted for the purpose of learning.

Although the satisfaction factor of this generation in using Kahoot or any kind of gamification is high, other elements should be analysed as well in order to get a clear picture and vision of gamification impact on students. That is why the analysis and correlation between survey elements and Kahoot results were made.

IV. STUDENT PERCEPTION

The collection of survey results was in purpose of understanding the student perception on motivation. Two key questions from the survey were used – regarding their motivation level and the level of reward importance, measured on a Likert scale of 1 to 5. In the next section, further analysis is made on those questions from the survey.

These results are created for further analysis with the Kahoot results, however, the results may be impacted by the different scenarios that were placed for both Croatian and English ICT groups. Also, the diversity of the international English group creates a certain limitation on interpretation of the results.

A. Survey

Both Croatian and English ICT groups were examined through survey regarding gamification. Croatian ICT group has a total sample of 60 students that had any Kahoot results, while English group has a sample of 22 students, although, with more international diversity. Students that didn't play or had an overall score of 0 were not analysed because there were couple of internet connectivity issues during the game for some students. After all Kahoot games that were played throughout the semester, making a total of 5 games for both groups, students participated in a survey in order to see their

perception regarding motivation and reward system in gamification. In the Croatian ICT group, there were 17 students, making 28,3% of the Kahoot sample, which also filled a survey, while in the English ICT group there were 13 students, making it a 59,1% of the English Kahoot sample.

At the end of the survey, the last question was referred to students as a comment section, being positive or negative. Most of the answers were positive and encouraging gamification as part of the class – even some of them had a recommendation of implementing it as a part of the grading system (not as extra percentage).

From the survey, the important results for this research were extracted to visualise the difference in gamification student perception – from Croatian ICT group and English ICT group. An average function was calculated for every question element from the survey – students' perception regarding satisfaction, motivation, rewarding system and competition factor when using Kahoot. The Likert scale was from a mark of 1 to 5.

Table 1 shows averages of the survey elements, where it is clear that marks are similar, and relatively high, for satisfaction (4,8 and 4,6) and the importance of the competition factor, which is a bit lower – but still similar (3,8 and 3,9).

TABLE II. SURVEY ELEMENTS – MEAN CORRELATION

Survey elements	CRO	ENG
Satisfaction	4,8	4,6
Motivation	4,6	3,9
Reward	4,8	3,7
Competition	3,8	3,9

As scenarios are different for both groups when considering reward systems, students' perceptions are drastically different in the elements of motivation and reward. Croatian ICT group has marked motivation factor with a high 4,6, while English ICT group has a mark perception of 3,9.

Because of the significant difference in survey results, motivation and reward are entering further analysis. This also states that there is a difference in student perception regarding gamification, which would be interesting to compare with

B. Survey - Motivation

In order to assess students' motivation and the impact on it through gamification, students from Croatian and English group have different opinions as the scenarios are different too.

In Figure 1, 70,6% of Croatian ICT group marked their motivation with a mark of 5, 17,6% with a mark of 4 and 11,8% with a mark of 3 – creating an high average value of 4,65%. The median and mode of Croatian ICT group are a high and strong mark of 5.

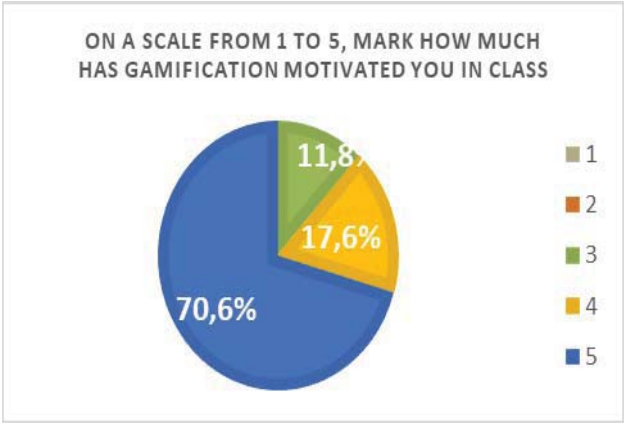

Figure 1. Kahoot motivation question – Croatian group

In Figure 2, the situation with the English ICT group is a bit different – which reflects the difference in scenarios of gamification usage in class (reward or no reward). 21,4% of English ICT grouped marked their motivation with a mark of 5, 50% with a mark of 4 and 28,6% with a mark of 3 – creating an average of 3,9. With other indicators such as mode and median, it is clear that the mark in this segment is 1 point below than the Croatian ICT group – making a mark of 4 for English ICT group.

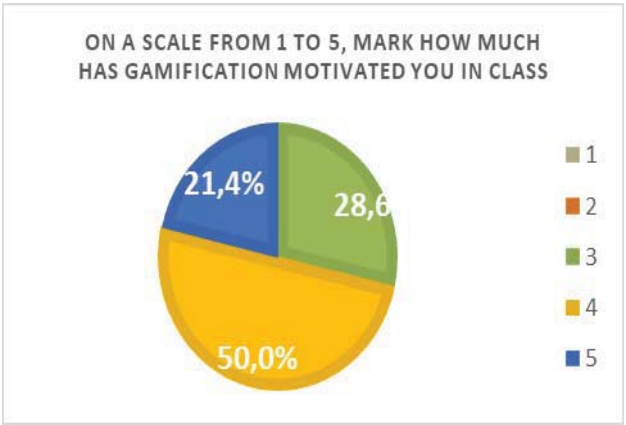

Figure 2. Kahoot motivation question – English group

C. Survey - Reward

Reward system plays a certain role in motivating and empowering student learning.

In the Croatian ICT group, 76,5% gave a mark of 5 regarding their perception on the importance of earning a reward in a game – while the rest gave a solid mark of 4, as it can be seen in Figure 3. Also, as more than 75% were already answered with the mark of 5, the median and mode also present the same mark of 5.

Figure 3. Kahoot reward question – Croatian group

Figure 4 shows different marks from the reward question on behalf of English ICT group – which had a scenario of using gamification as a revise tool, not for additional points or any kind of reward for playing. The importance of the reward shows 21% of answers as a mark of 5, 36% for both marks of 4 and 3 (creating a ponder of 72% altogether) and 7% with an importance mark of 2.

Figure 4. Kahoot reward question – English group

Students perception is clearly different when they face a certain scenario that applies as a rule for the whole semester – student perception on motivation and reward is bigger if they know about the reward system. However, the diversity of the international English group may also impact the results as there are different background points such as culture, education system, maturity, etc. There was also a certain difference in age since some of the exchange students were older and graduate students, while ICT as a course is part of the 1st year undergraduate program.

V. Research Results

In the next research headings, first analysis will cover both surveys and Kahoots' absolute and relative values, following with the correlation analysis of the Kahoot relative values and final students' grades. Afterwards, Kahoot relative values and survey important elements – motivation and reward system. This paper is using both absolute and relative values in order to present the data in the best way, so the correlation between the groups is using absolute Kahoot results and within the groups' relative Kahoot results.

A. Absolute Kahoot values

Kahoot results depend on the correctness of an answer and the time taken for clicking the answer – the faster answer is pressed, more points is awarded. As both ICT groups used 5 Kahoot games, all of the results, or absolute values, were summed for every student. Using this approach, every student collected a certain number of points from the Kahoot games and the average absolute values for Croatian and English ICT groups could be compared. The averaged absolute value for Croatian ICT group is 19.757,97, while for English was 10.979,82 – almost half of the Croatian groups value.

This presented gap between Croatian and English average absolute values shows how students with bigger motivation had better results in the Kahoot games. This result proves how earning a reward positively motivates students to do better.

B. Relative Kahoot value and student grades

Relative Kahoot values were adjusted from absolute values so it would be considered more accurate when calculating results within each group.

Figure 5 and 6 show the scatter plot for Croatian and English ICT groups where it correlates student success in Kahoot with their final grades. Both figures show that the higher score in Kahoot equals a bigger probability in having a better final grade.

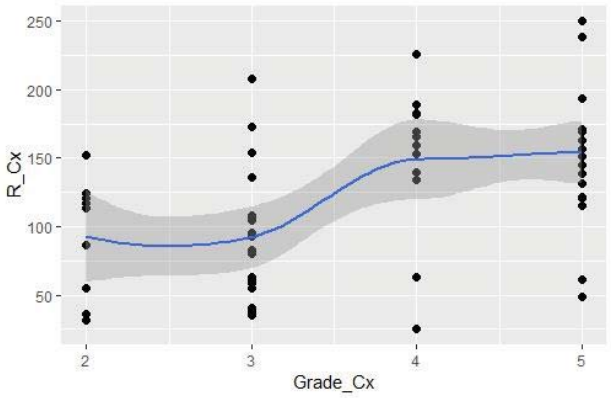

Figure 5. Kahoot relative values and students grades - Croatian group scatter plot

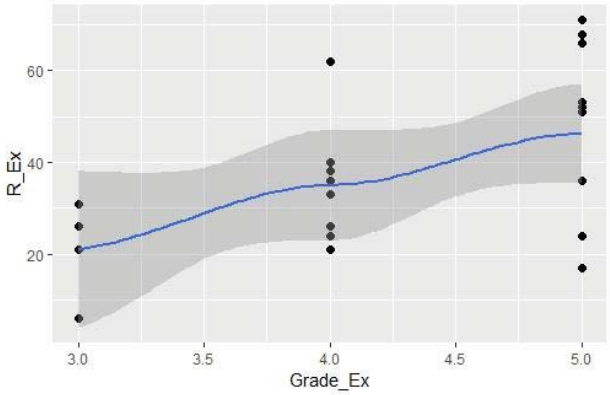

Figure 6. Kahoot relative values and students grades - English group scatter plot

The correlation for Croatian group is moderate (0,48), and so is for English – but slightly higher (0,52). However, there are also a lot of other elements that may influence the final grade of any student.

In order to examine the data set more detailed, the set was separated on male and female students in each group. Tables of boxplots (Table III) and Boxplots (Figure 7 and 8) were created to show the difference between minimum, median, mode, maximum, 1st and 3rd quartile values of both groups (in relative values). It is interesting to see the difference between groups based on gender. In Croatian ICT group, females' values exceed males, while in English group the situation is reversed.

TABLE III. STATISTICS OF BOTH GROUPS FOR BOXPLOT

	ICT CRO Relative value	ICT ENG Relative value
Minimum	25,00	6,00
1st Quartile	75,75	24,00
Median	121,50	34,50
Mean	123,47	37,55
3rd Quartile	163,75	51,75
Maximum	250,00	71,0

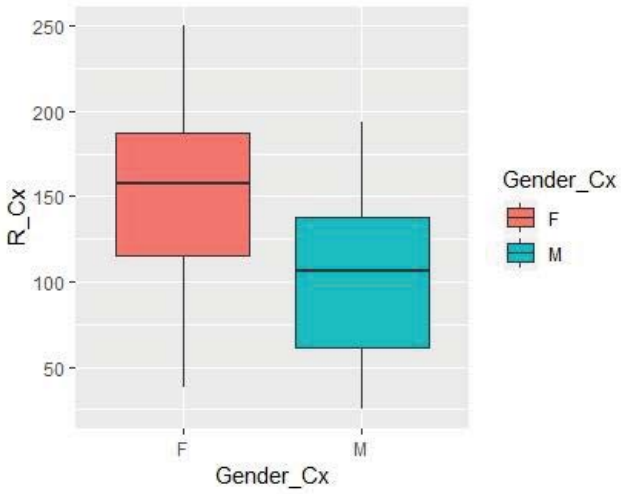

Figure 7. Kahoot relative values and gender - Croatian group box plot

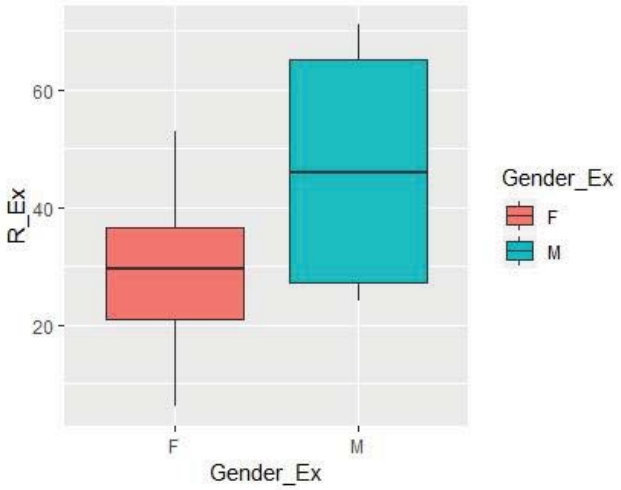

Figure 8. Kahoot relative values and gender - English group box plot

C. *Relative Kahoot values and motivation*

The correlation between relative Kahoot values and motivation marks are different for both groups. Figure 9 shows a perfect scatterplot of Croatian ICT group with high significance – the higher the motivation, the better Kahoot scores.

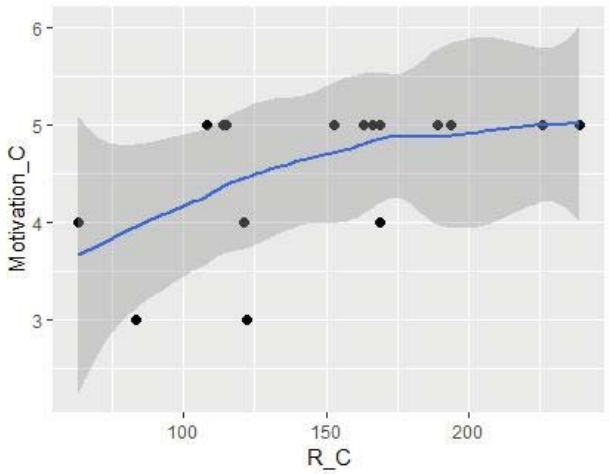

Figure 9. Kahoot relative values and motivation - Croatian group scatter plot

However, the correlation between relative Kahoot values and motivation marks for English ICT groups is of low significance as it is mostly scattered – due to the scenario of gamification usage and interantional diversity. Figure 10 shows the English ICT group scatter plot regarding motivation and relative values. The correlation level for both cases is at the lower moderate border, Croatian group with a 0,54 and English 0,36.

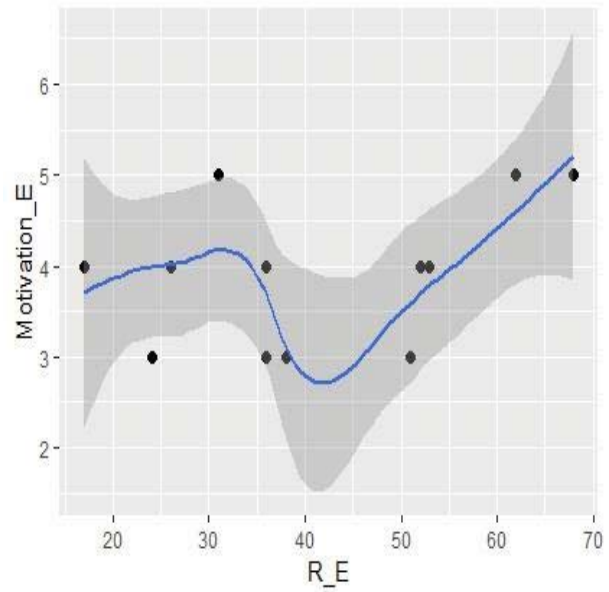

Figure 10. Kahoot relative values and motivation - English group scatter plot

D. Relative Kahoot values and reward

The correlation between relative Kahoot values that a student earned by playing and their perception on the importance of a reward system is also different for both groups.

The Croatian ICT group, as shown in Figure 11, shows the strong importance of a reward system as there is no mark under 4.

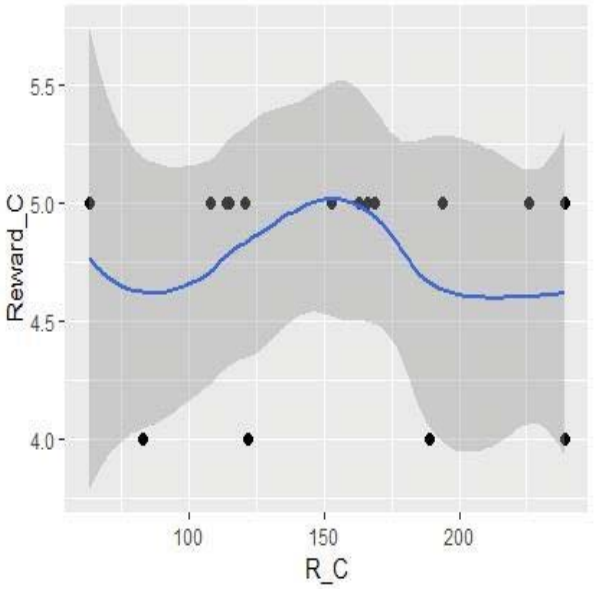

Figure 11. Kahoot relative values and reward - Croatian group scatter plot

For the English ICT group in Figure 12, the data is again scattered as it depends mostly on the diversity and the scenario chosen for rewarding students.

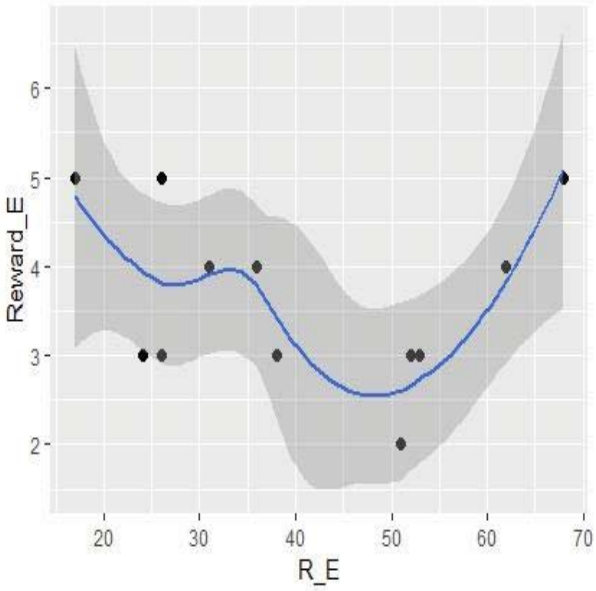

Figure 12. Kahoot relative values and reward - English group scatter plot

The correlation level for both cases is negative and very low, meaning it is not significant. Croatian student group had -0,036 and English -0,13.

VI. CONCLUSION

This paper shows how reward system in gamification influences student motivation regarding course activities through semester. It was evident how student perception towards motivation and rewarding system questions from the survey is different for Croatian and English ICT group because of the difference in reward system scenario. Meaning, Croatian group of students had higher marks than English group regarding motivation and the importance of some kind of a reward – because they had a reward scenario, unlike the English group. The higher motivation was also visible in the mean comparison of both groups absolute Kahoot values, as Croatian group had almost twice as bigger of the wanted mean. This result clearly shows how students do better in the Kahoot as they know they will be rewarded for it - revealing their true motivation – extrinsic motivation. The relationship between Kahoot score and final student grade is still in a positive correlation, as expected. However, the correlation of certain elements in the English group was a bit scattered and had no consistency because of the international diversity – the difference in cultural aspect, educational aspect, maturity aspect (some of the students were graduate level on an undergraduate course), etc.

For further research, it would be interesting to see gamification usage and successfulness through different tools, such as having a student profile throughout the semester which is growing by completing certain tasks and activities for earning Badges. The correlation of student profile success in gamification and final grades should provide decent insights on the student motivation perception.

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