Students' Perception of Gamification in Higher Education Courses

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Abstract. *This paper presents an analysis of students' perceptions on the concept and elements of gamification, after completing a partly gamified ERPSIM course within the scope of the Enterprise Resource Planning systems course. The results indicate that students' attitudes towards gamification is mostly positive and does not depend on their engagement in playing games in their free time. The most common gamification elements are examined and discussed based on the students' feedback collected via questionnaires. Not all the gamification concepts are regarded/perceived to be equally beneficial. However, students strongly believe that the gamification of courses can contribute to their motivation and learning achievements.*

Keywords. gamification, gamification in higher education, ERPSim, game mechanics, e-learning, teaching methods, gamification elements

1 Introduction

Nowadays more people have or are enrolled in tertiary education than ever before. From 1995 to 2015, the percentage of young (25-34 year old) adults with tertiary education has risen from 23.3% to 42.12% within member countries of the Organisation for Economic Co-operation and Development (OECD, 2015). More people are studying now and the education rate is higher than ever before.

Globalization has changed higher education (HE) forever. The massification of HE among other factors has led to its declining quality. While the top academic institutions have maintained their quality, the system has suffered (Altbach, 2015). This is natural because increasing the quantity several times over, often leads to a drop of quality. It is prime time to react to those changes and address the problem by reinventing the paradigm in higher education once again. But even new paradigms such as e-learning and MOOC (Massive open Online Courses) by themselves do not eliminate/reduce some well-known challenges, namely learners' engagement and motivation, a high dropout rate, etc.

One of the leading forces of change in transforming education is Information Technology (IT). Another industry where IT technologies are omnipresent is entertainment. One trillion dollars are spent yearly on entertainment (Vogel, 2014) out of which more than 100 billion are spent on gaming (Newzoo, 2016).

Games are ubiquitous in the digital world we are living in. In the USA, 42 percent of the population play video games three or more hours per week. Gamers are almost equally represented by both genders: 44 percent of all game players are female; 56 percent are male. The misconception that playing games is only for the young has been proven wrong, with the average game player being 35 years old (ESA, 2015).

Because gaming is widely popular and accepted by population, attempts to use various elements from gaming have been made in work and education. Gamification elements were already used in the early Soviet era as a way to incentivize work. Gamification also re-emerged in the US in the early 1980 (Iosup et al., 2014).

Gamification is the use of game design elements in non-game contexts media (Deterding et al., 2011). Gamification may be a crucial tool that higher education is missing.

Gamification can be successfully integrated with e-learning. E-learning is defined as information and communication technologies being used to support students to improve their learning. It has one major problem; many of its implementations do not achieve the intended objectives due to non-compliance and

lack of knowledge of methods & techniques for the development of online information systems. In those systems, user satisfaction is the most important component and is influenced by six factors: students, teachers, the course, technology, system design and environment. These factors, particularly efficiency, effectiveness, motivation and engagement of students can be improved with the use of gamification (Urh et al., 2015).

Traditional teaching methods in higher education (lecturing, frontal teaching) only convey information from the lecturer to the students, but they do not promote interaction and further thoughts. In recent years, traditional university teaching has changed due to advances in information and communication technology. Learning management systems have emerged, systems that implement administration functionalities, educational interaction and other educating methods can complement traditional teaching methods. Research results have shown that models that integrate game mechanics achieve more motivation and enjoyment, but do not always result in increasing learning efficiency (Siemon & Eckardt, 2017).

Teaching is a multi-step process where each step needs support from the previous steps in the process.

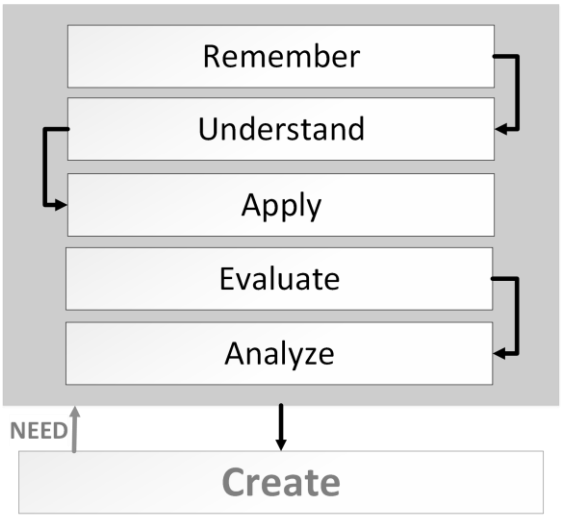

Figure 1. Simplified illustration of teaching according to Bloom's taxonomy (adapted from Jayasinghe & Dharmaratne, 2003)

The five steps in **Figure 1** Simplified illustration of teaching according to Bloom's taxonomy (adapted from Jayasinghe & Dharmaratne, 2003)mean the following tasks need to be completed in order to truly learn something:

1. Before we can understand a concept, we must remember it,
2. Before we can apply the concept, we must understand it,
3. Before we analyze it, we must be able to apply it,
4. Before we can evaluate its impact, we must analyze it,
5. Before we can create, we must remember, understand, apply, analyze and evaluate.

Students can be classified according to their main motivation when engaging in games or gamified activities, by using Bartle's taxonomy (Arnold, 2014):

- Socializers – more interested in having relationships with other players than playing. Spread knowledge and human feeling.
- Achievers – very competitive, enjoy beating difficult challenges.
- Killers – like to provoke other players and impose themselves over other players.
- Explorers – explore the world and finer details of the game mechanics. They thrive on discovering everything.

The use of gamification can guide the students to unknowingly follow the above learning processes, even in difficult academic matters, in an efficient way (Jayasinghe & Dharmaratne, 2003).

Gamification-based teaching can have a positive impact on achievement and students' attitudes toward lessons as well as their attitudes. Students in experimental groups have outperformed those in a control group (Yildirim, 2017).

The gamification of courses can also cause negative side effects, such as an increased workload for both students and teachers (Siemon & Eckardt, 2017).

The purpose of our study was to investigate the viability of using gamification in higher education courses, by analysing the reflection of students after completing a short workshop which used some gamification elements and connecting it with other established studies in this field. We aimed to find the answers to the following questions: *How do students accept the gamification approach? Are students who play games regularly more receptive to gamification? Which practices of gamification are students most receptive to?*

Some positive preliminary results were already collected in (Heričko, Rajšp, Beranič, & Wu, 2017) that investigated use of business simulation game approach for introduction to the postgraduate Enterprise Resource Planning course.

This research paper is structured as follows; first, similar research in using gamification and e-learning for knowledge acquisition is presented, then research on gamification in higher education with the most commonly used gamification elements and ideas is explored; the fourth section gives a short summary of the workshop we executed in the scope of the ERP course; continuing students' feedback on the course gamification approach is presented and in the end the findings are summarized.

2 Related works

Lot of research has already been done on the use of gamification in higher education.

Five gamification platforms (VivoMiles, Youtopia, Uboost, Cdedly, OpenBadges.me, ClassDojo and ClassBadges) were presented, two of them were used (ClassDojo and ClassBadges) to introduce gamification to their study programme. The study found that one of the vital parts of successfully using gamification is participation and willingness to integrate gamification in their courses by the educators. Gamification reinforces not only good behaviour by awarding badges to a student, but also intimidates students to act improperly because of fear of getting punished with badges, which have a negative connotation. Overall, the attitude of students when using gamification elements in their courses improves (da Rocha Seixas et al., 2016).

Review of gamification studies presents the topic in general and presents some of the most common gamification elements (Points, Levels/Stages, Badges, Leaderboards, Prizes and Rewards, Progress bars, Storyline, Feedback) (Fui-Hoon Nah et al., 2014).

The efficiency of e-learning systems can be increased using gamification elements in them. Gamification is a key enabler of e-learning in higher education. In the paper (Urh et al., 2015), a model for the introduction of gamification into the field of e-learning is presented.

(Mora, Planas & Arnedo-Moreno, 2016) investigated if adult learners can be motivated in solving formative activities in a game like a design course. They designed their experimental course on the principles of SPARC: Sense – the activity must make sense to the students; Purpose – the activity must have a clear purpose. The purpose should be aligned with some learning outcome; Autonomy – the activity should be optional, and students should have the ability to make choices; Relatedness – actions should have some positive impact on the rest of participants or the course itself, Competency – the activity must ensure that students will be able to master the rules and the chosen tool. Their course received a very high acceptance of such design and a good degree of engagement.

A gamified software engineering course containing the following gamification elements: narrative (story); progression by use of experience points for completing tasks and levels; badges that were used in displaying player levels; progress bars that show progression to the next level; quests – team based tasks; challenges; achievements, created to study the effects of gamification. (Matsubara & da Silva, 2017) noted that they avoided the use of leaderboards, because players on the bottom may lose motivation upon seeing the divide between them and the top participants. The attendance rate of those participating rose and their average grades on the final exam were higher than those participating in the traditional course.

An empirical literature review concluded that empirical studies investigating gamification have mostly found a positive effect on learning outcomes. Some of the reviewed studies, however, warned of negative effects – increased competition, task evaluation difficulties, and problems in design features. Another limitation regarding gamification studies is their relatively small sample size and the fact they were performed for short periods of time (one workshop or part of a course), so that the long-term benefits could not be fully established (Hamari, Koivisto, & Sarsa, 2014).

Our study was aimed at comparing their results to ours.

3 A case study

3.1 ERPSIM sessions

For the gamification element, ERP distribution simulation game developed by HEC Montreal (Leger et al., 2010) was used. The game was moderated by certified instructor Paul Wu Horng-Jyh. The purpose of the game was to teach the basics of SAP, ERP system, by giving each team a company that distributes water bottles to the retail stores in Germany. The players were split into teams, given instructions and then played the game.

The simulation game contains the following gamification elements:

- Point system and leaderboards: the game measures team performance by their profits and constructs a leaderboard based on that,
- Time restriction: teams have a limited amount of time to make decisions, each day lasts less than a minute,
- Interactive Cooperation: in the simulation game players are forced to split their tasks between team members, because they have limited time to complete their turns,
- Tutorial: players receive video guides and a help sheet on paper,
- Consequences: each action in-game carries some measurable consequences,
- Strategy: the team must find the right balance between pricing products, restocking amount and time and marketing expenses,
- Scarcity: the market was fixed in size and each team had to compete to achieve as much profit as possible,

This allowed students to experience some of the key approaches used in the gamification of education.

The students first met with this game at the start of the ERP course (Heričko, et al., 2017), when we established the usefulness of using an ERP simulation

game as a tool to introduce students to the vast area of ERP systems. In the first iteration, we concluded that using an ERP simulation game was beneficial for introducing students to the ERP course (Heričko et al., 2017). The students felt that they gained a lot of new knowledge, that the workshop was fun and that the approach was suitable to introfducing ERP systems to them. The instructors were interviewed and they all found the ERP simulation game approach adequate.

We observed problems that are typical in gamification: up to 40% of students felt that their main goal was to win, but not to gain new knowledge and almost 40% of students felt that groups were withholding their information to some degree to obtain a competitive advantage (Heričko et al., 2017).

We replicated a gamified ERPSIM session at the end of the course on ERP. The purpose was to show the students an example of gamification in practice. This provided them with deeper insight and understanding of the gamification principles and benefits.

3.2 Research method

We prepared a survey to investigate how suitable and effective gamification in higher education courses is, by analysing the reflections of students after completing a short workshop, which used some gamification elements. The following research questions were formed:

- RQ1 - How do students accept the gamification approach?
- RQ2 - Which practices of gamification are students most receptive to?
- RQ3 - Are students who play games regularly more receptive to gamification?

Data was collected from the workshop participants with an online questionnaire after completing the workshop. The number of obtained observations was 15. The study was performed on 1st year master students at the Informatics and Technologies of Communication programme, which is offered by the Faculty of Electrical Engineering and Computer Science at the University of Maribor.

The participant questionnaire consisted of questions and statements, which respondents were asked to evaluate and assess using a 5-point Likert scale, with the following responses: completely agree; agree; neither agree, nor disagree; disagree; strongly disagree. The statements were grouped into the following categories:

- Statements about the suitability of gamification elements/concepts,
- General statements about gamification,
- Statements about student habits, engagement and participation,

Through the collected results, we were able to examine the suitability and effectiveness of gamification. During the discussion, the results were rounded to the nearest percentage point.

Gamification and each gamification concept was explained to the students in material, which was presented to them in addition to the questionnaire.

3.3 Results discussion

We were interested in the team aspects of the workshop. We asked participants to rate the following statements and received the results seen in Figure 2:

- S1 – The results of engaging in a gamified workshop should be part of the academic grade of a course where possible,
- S2 – Gamification is more suitable when students are divided into groups, because students then feel a sense of belonging,
- S3 – I would rather compete against players than the environment,
- S4 – E-learning environments (such as Moodle) should be upgraded with elements of gamification,
- S5 – Project tasks that are a part of academic courses lack elements of gamification,
- S6 – Participating in educational games in teams leads to specialization of players in individual functions, so we should plan the model in advance to guarantee the rotation of functions within a group,
- S7 – If teaching associates would participate and compete in gamified environments with students, student motivation would be impacted positively,

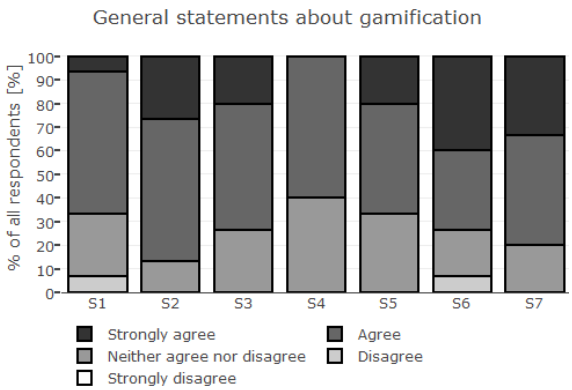

Figure 2. Gamification statements

Students generally agreed with all the statements, but there was less agreement about the possibility of gamified workshops presenting a part of the academic grade of a course where possible (S1) - 67% of all respondents agreed or highly agreed, and that e-learning environments should be upgraded with elements of gamification (S4) - 60% agreed and 40%

neither agreed, nor disagreed. What should be noted is that most students (73%) would rather compete against human competition (players), than some arbitrary environment (S3), which should be noted when preparing a gamified environment. Students liked team-based gamified environments much more than environments, where they are expected to participate alone (S2). It is also interesting that most students would like (if possible) to compete against their teaching associates (S7). Most students would also prefer that project tasks in courses would have gamification elements included in themselves (S5) and agreed that we must be careful, because splitting students into teams with no additional instructions will lead to the specialization of players to specific tasks. The willingness of students to extend gamification found in our study is quite remarkable, since (Domínguez et al., 2013) reports that more than half students felt less motivated when gamification was applied.

Table 1. Answers to "Gamification statements" comparing non-gamers and gamers in %

Stat.	CA[1]		A		NA		D		CD	
1	10	/	50	80	40	/	/	20	/	/
4	/	/	60	60	40	40	/	/	/	/
5	10	40	60	20	30	40	/	/	/	/
	N[2]	**G**	**N**	**G**	**N**	**G**	**N**	**G**	**N**	**G**

We also asked the players if they play games on a weekly basis as seen in **Table 1**. Five of them answered yes and 10 of them no. We then compared the answers to relevant statements (S1, S4, S5) to see, if they approve of gamification. We used the Freeman-Halton extension of Fisher's exact test to test if any correlation exists between individuals that play games weekly and those who do not. We found the following correlations 0.201 (S1), 1.000 (S4) and 0.394 (S5). Because of the small sample size, we could not conclusively determine if significant differences existed between those two groups of students in their perception of gamification.

We were interested in how students rated the suitability for each of the following gamification aspects: *Points, Levels, Trophies/Badges, Virtual Goods, Storyline, Time Restrictions, Aesthetics, Leaderboards, Interactive Cooperation, Experience Points, In-game Rewards, Mission and Objectives, Unlockable Content, Adjustable levels of difficulty, Tutorial, Scarcity, Anonymity, Consequences, Loss Aversion, Strategy, Branching Choices, Customization* (all of elements and concepts adapted from (Jackson, 2016), (Fui-Hoon Nah et al., 2014) and (Marczewski, 2017)).

The gamification elements with the lowest approval rating from students as seen in **Figure 3** were Loss Aversion – only 47% of students agreed or strongly agreed that the concept was suitable; Anonymity had the same suitability rating.

The highest approval was received for both the Tutorial and Mission and objectives– 93% said that the concepts were suitable.

Among other highly rated concepts were Strategy Points, Unlockable Content, Levels, In-game Rewards (in all instances, only 13% felt neutral or less), Consequences (20% did not strongly agree or agree) and Branching Choices (20% did not strongly agree or agree).

Comparing them with other studies, there were some responses that strongly disagreed with Trophies/Badges, which is supported by (Hanus & Fox, 2015) who found that Badges/Trophies can sometimes be harmful to student perception and In-game Rewards, and this is consistent with (Domínguez et al., 2013) who found that some students were not motivated by rewards, and even felt manipulated when they were introduced. Leaderboards received a highly positive rating which is remarkable, considering that (Dias, 2017) found some students feel demotivated by the presence of ranking, because they do not want to be publicly compared to their peers.

[1] CA – completely agree, A – agree, NA – neither agree nor disagree, D – disagree, CD – completely disagree

[2] N – doesn't play games weekly, G – plays games weekly

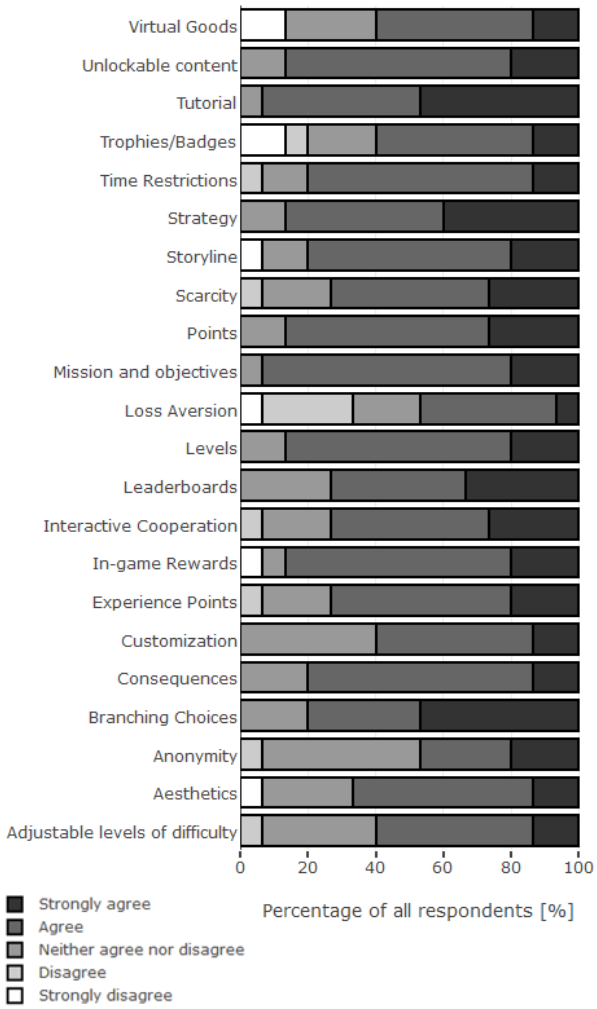

Figure 3. Suitability of gamification concepts/principles as perceived by students

4 Conclusion

Based on positive student feedback, we can conclude that students accept the gamification approach and find it beneficial. Students, to a certain extent, believe that their participation in such workshops could even determine part of their academic grade. They feel that E-learning environments are suitable for gamification.

No correlation was found between playing games and their attitude and opinion about gamification.

Those wishing to implement gamification environments should not just look at the gamification elements themselves, but also acknowledge players' tendency to compete against players, rather than the environment. Another way to increase motivation is to include teachers as participants if gamification offers direct competition among students. But before implementing any competing elements (leaderboards, points, public badges or trophies, etc.) we must carefully design a system in such a way that bottom ranked players do not feel demotivated.

The tutorial as well as the Mission and Objectives were determined to be the most highly regarded gamification concepts for the students. Providing an adequate tutorial for students is a must and students must feel that they have some concrete mission and objectives. Those two elements were closely followed by Strategy, Points, Unlockable Content, Levels and In-game Rewards, which were also widely accepted by the students.

Since a small number of students had a lower approval rating for some gamification elements, further research may include splitting students into a gamified and non-gamified course on a voluntary basis. (Glover, 2013) recommended the gamification be optional and found a negative effect for motivation on perception when gamification was applied to people with already high motivation.

Gamification is just an additional tool to achieve goals in higher education, and not every tool is good for everything. We should not look at gamification as just another buzzword or the next big thing that needs to be omnipresent in our curriculum, but implement it when we have good reasons and arguments to do so.

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