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Gamification in Higher Education (Case Study on a Management Subject)

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Abstract. In today's education systems, new solutions are required for educators to raise and maintain the interest of young people (from primary school to higher education). The aim of the study is to present a self-developed gamification solution and its application in higher education in economics. The method, the process, and experiences presented in the study were tested within the framework of a management subject. The gamification model, based on an extensive literature review, was elaborated with the help of a self-developed method. Prior to the development of the process, students' opinions on their experiences and expectations for current educational methods were surveyed. After the end of the semester, our students were asked on their feedback, and a national survey was conducted in higher education institutions about the experiences with gamification solutions. The positive consequences of the application of our own model, can be traced in the students' continuous and year-end performance (a higher level of task solutions and better grades) and also in their feedback.
Although the subject of the test semester was a management-type subject, the logic of the model can be applied within the framework of any other subject and in any higher education institution as well.

Keywords: flow; gamification; gamification model; higher education; management; motivation

1. Introduction

Raising and maintaining the attention of young people has been a problem for years on all levels and in all fields of education. It is a global problem and can be found all around the world. Beyond the digital world, young people are not interested in anything, they cannot concentrate on one thing for more than a few minutes, and they constantly hang out on screens – opinions generally say. A group of researchers (Wang et al, 2014; Barak, 2020) believe that this inattentiveness (disorganisation) is inherent in our digital world, as the human brain is unable to develop as fast as the technology it creates. It is also an everyday experience that they are able to listen to music, search in browsers, chat with friends while watching TV. It indicates that they can still pay attention to what interests them. Constant opportunities for expression and interactive activities are also expected in different education systems. Teachers and lecturers face this challenge; in education, interactive techniques should be used that meet the needs of young people (Steigerwald, 2016). Young people in educational institutions should be prepared for the future, where they will have to deal with complex, multidisciplinary problems and approach global challenges from a new perspective (Schwab, 2016).

21st century higher education is not only about acquiring knowledge in a single field of science. Higher-level skills such as critical thinking, creative problem solving, teamwork and communication, and also soft skills are becoming increasingly valuable. Due to the multiplication of data and information, the selection and critical evaluation of, and the appropriate decision-making based on relevant information is essential for the success of the society of the future. Today, lecturers in higher education not only have to pass on information, knowledge content, and students – unlike former students – not only take and internalise that. Thanks to modern technological tools, students are capable of quickly finding anything on their smart devices but this knowledge is superficial. The task of the teacher is to make underlying content and connections understood. Young people should be taught to process information so as to understand its meaning and interplay, and their conceptual and practical skills. The role of teachers is becoming increasingly important in this process (Zivkovil, 2016; Kereluik, Mishra, Fahnoe & Terry, 2014; Kivunja, 2014).

Higher education institutions are aware of the need to increase investments in education, although they are not able to do so at the same level. This is also the reason for the increase in the number of researchers seeking effective ways of education, teaching-learning in recent years. The results of research by Deslauriers and colleagues (Deslauriers, Schelew & Wieman, 2011) showed about 10 years ago that traditional presentation-oriented education does not provide 21st century key skills. In interactive education, students become equal participants of research-based learning, exploratory innovation, and the process of learning from mistakes. A most important benefit of this new solution is that they learn to think, decide and act in context, thus developing their professional identity. As a result, they become more ambitious not only in educational institutions but also in real life (Holmes et al, 2015).

Freeman and colleagues (2014) have shown that interactive methods increase the efficiency of education by giving students a deeper understanding of concepts, and as a result of activity, they spend a significant part of their time in the classroom. During the course of education, they do activities that require extensive information gathering using electronic devices or answering questions, filling out worksheets on web interfaces, analysing problems and constantly communicating. Such interactive techniques make education more attractive, authentic and satisfying – full of challenges that young people have to address –, thus increasing the efficiency of learning (Talbot, Doughty, Nasim, Hartley & Le, 2016).

One method that meets the above requirements is gamification. Several studies support (Han-Huei Tsaya, Kofinasb & Luo, 2018; Goksuna & Gursoy, 2019) that, with the help of games, both children and adults absorb knowledge much deeper and more thoroughly. Huotari & Hamari (2017) approach gamification as a service developing process, where the generation of a game-like experience supports user value creation. The application of game elements in higher education is often biased, many consider it frivolous, although research has shown its positive effects (Nah, Zeng, Telaprolu, Ayyappa & Eschenbrenner, 2014). The experimental teaching method illustrated below attempts to test this contradiction.

In this research, which is a kind of case study, answers to the following research question were sought: What impacts does gamified education have on the students' in-class and out-of-class activity? How do they relate to the new method? Is the positive impact of gamified education on learning results traceable? What do higher education lecturers think of the possible applications of gamification? Answering the questions seemed possible with the help of our own 'experimental' education. The study summarises the experiences that present the gamified solution of a management subject taught in economic higher education. The method preferred creativity more than a solution involving financial investments. Education required Internet access, laptops, tablets or any kind of smart devices (available to all students without exception). No further specific software is needed. The experiences of the experimental education show that the majority of the participating young people enjoyed and found the gamified solution useful, which was also confirmed by the end-of-semester grades. Colleagues from other educational institutions surveyed had mixed feelings and varied opinions about gamification as a method, but few have their own experience.

2. Literature review

2.1. The impact of media on the human brain

The young generation studying at universities is also called Generation Z. The first ones (born between 1995 and 2000) who were there at the beginning of the digital era. Children born in the second wave (between 2005-2010) were already born into the digital world. In this world, you already have to be present on social media sites, on-demand entertainment (whenever you want it) is self-evident. For them, info-communication technology (ICT) is a natural part of life, which fills all

segments of society. They enjoy it and want to make the most of the opportunities, they live in the moment, talk less and keep things brief (Tari, 2015; Seemiller & Grace, 2016).

Several studies have discussed the impacts of media on the human brain. They showed that media changes our habits and routines (Valkenburg, Joche, & Walther, 2016; Uncapher & Wagner, 2018; Crone & Konijn, 2018). Carr (2010) described his feelings that his brain was constantly "hungry", and demanded the Internet to feed it in its own way, but the more it received, the "hungrier" it became. Today, we know that our brain is constantly changing, and adapts to the slightest changes in circumstances and behaviour. This wonderful property is called plasticity. Neuroplasticity is the most important result of evolution, which allows individuals to adapt to changed circumstances and reorganise themselves throughout their lives or even in the course of a few days (Hanson, 2017; Price & Duman, 2019). During adolescence, significant changes take place in the brain. Nerve cells that are not used regularly die, so in some cases high-performing students in secondary school fail in higher education because weak functions of their brains are overburdened by increased strain (Carr, 2010). More studies indicate the fact that when having to switch between two tasks confuses our brain and increases cognitive load, and also the possibility of not registering important information (Kirschner & Karpinski, 2010; Junco & Cotten, 2012).

As a result of the use of multimedia devices for several hours a day, young people's brains have adapted and their brain maps have rearranged. You could say: their brains 'work' differently from their parents. Today's young generation is heavily burdened by academic traditions: the curriculum (content that we teach) and the teaching methods (how we teach). A kind of reaction to this is the use of interactive teaching methods in higher educational institutions.

2.2. Interactive teaching methods

Active/interactive reading improves the learning process as it provides students with more starting points. These are important because students come to school with different knowledge or culture. Innovative education offers more opportunities for correcting misconceptions, providing timely feedback, or integrating different viewpoints through debate and discovery (Holmes et al., 2015) as the responsibility for the education, which combines different educational methods to meet various professional directions and student aspirations (Deslauriers et al., 2011; Hoellwarth & Moelter, 2011; Freemann et al., 2014; Von Korff et al., 2016). According to Tamim and colleagues (Tamim, Bernard, Borokhovski, Abrami & Schmid, 2011), shifts towards students. These methods are able to adapt to the abilities of individuals, trainings can become more effective and provide participants with a higher level of satisfaction. One of the solutions to active/interactive learning is gamification.

2.3. Gamification

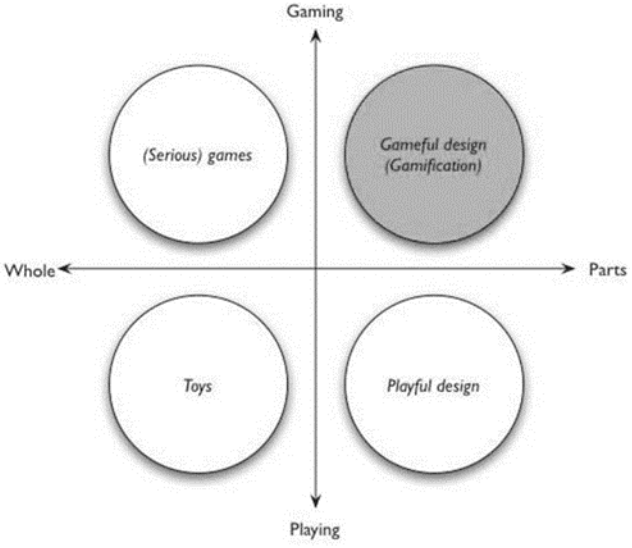
The term gamification was born from the word 'game' and the suffix '-fication' transform into something, in the digital media industry. It was first used by Pelling (2011) in 2002, but gained public awareness only in 2010. The most significant difference between game and gamification is that while games are

always self-serving, and the focus is on fun and gaming experience, gamification always has some out-of-the-game, useful purpose.

According to the most widely accepted definition, gamification is the application of game elements and mechanisms in an out-of-the-game environment (Deterding et al., 2011). According to Kapp (2012), gamification is a strategy that aims to change user behaviours in a positive direction by applying elements of game design and game aesthetics. The basic idea is that human activity is more efficient if the task to be performed is enjoyable and there is joy both in the work process and the result. The two definitions are consistent.

To understand the definition, we need to distinguish two types of games, for which there are two separate words. 'Play' means the free, spontaneous, self-directed game of childhood (Santayana, 1955). By contrast, "game" means a game subject to rules, with a purpose and quantifiable outcome (Salen & Zimmerman, 2004). The French thinker, Caillois (2001), conveys the same difference by the terms ludus and paidia. Paidia (from the Greek pais "kid" root) is an exuberant, spontaneous manifestation of the playful instinct, while ludus (play) borrowed from Latin is characterised by brainwork, instructions and limitations.

Gamification uses game design elements that ban be categorised as ludus. The creators of the definition illustrate this concept on a twice two-element matrix (see Figure 1). On one axis you find playfulness as opposed to gamefulness, while on the other axis holism as opposed to construction from elements. According to the definition, gamification does not use complete games (in other words, full-fledged games), only game elements, and not playful design, but gameful design.



Source: Deterding et al., 2011
Figure 1. Gamification and related concepts

Gamification occurs in an out-of-the-game context, so it does not create or complete games, but supports other systems with game elements, for instance, in

the educational or business spheres. The aim of gamification is therefore not to entertain but to increase engagement, motivation and user experience.

The creators of the definition distinguish three types of game elements: game technology, playful design and game-based procedures, of which gamification uses only game design elements. Subsequently, gamification is not linked to the use of digital technologies (Deterding et al., 2011; Dulova Spisakova, 2017).

The logic of gamification is a blend of game design tools and psychology. It can be divided into three levels, which include regulatory, behavioural and emotional components that are also called MDA (Mechanics, Dynamics Aesthetics) model. Breaking down to factors, you can formulate the three elements of the gamification system (Kim, 2015).

For game mechanics, various rewarding tools are listed, such as collectable points, badges, achievable levels, challenges and missions, virtual assets and gifts. Game dynamics denote human desires such as reward, status, performance, self-expression, competition and altruism (Dicheva, Dichev, Agre & Angelova, 2015; Aliyu, 2020). Aesthetics is the third and final elements of the MDA model, which describes what reactions the game process evokes in the player. These emotions can come from: trying out something new, completing a challenge, exploration and adventure, belonging to a community, the opportunity of self-expression, immersion in a fantasy world (Kusuma. Wigati & Utomo, 2018). Players react emotionally to each part of the game, so they will have game experience and develop their cognitive and social competencies (Deterding et al., 2011; Kapp, 2012).

A few years ago, game researchers only studied the negative effects of games. They paid great attention to addictive attributes (Gentile et al., 2011), and game-induced aggressive behaviour (Bushman, Rothstein & Anderson, 2010; Rozsa, 2019). Today, they endeavour to exploit the positives.

Based on a decision by the U.S. Food and Drug Administration (FDA) released in June 2020, experts used Akili's game called EndeavorRx to treat children with Attention Deficit Hyperactivity Disorder (ADHD). The FDA's decision is a milestone in the growing field of digital therapies, as this is the first time an authority authorised a video game therapy for any health condition. The studies have tested the new method with more than 600 children over 7 years. Clinical trials results showed that one-third of the participating children had a measurable improvement in their attention deficit after playing 25 minutes a day, five times a week for four weeks. The manufacturer claims that the game is able to activate and strengthen certain neural networks through targeted algorithms. The following period may bring new challenges for the company, as they must convince doctors that the game is worth prescribing to children, and health insurers to cover treatment costs (FDA, n.d; Collins et al., 2020; Mura, Gontkovicova, Dulova Spisakova & Hajduova, 2019).

Sheldon's (2012) experiment is often mentioned as a successful gamification example in higher education, who gamified the university course on the example of MMORPG (Massively Multiplayer Online Role-Playing Game). In his solution, students moved levels based on points, based on which they received their final grades. He recognised that the simplest point and level systems, and the immediate feedback motivate students. Ryan and his colleagues claim that planning a good game is difficult, and planning a good educational game is even more difficult (Ryan, Costello & Stapleton, 2012).

Various simulation programs belonging to the 'serious game' category mentioned above are used at universities, especially in teaching economics subjects. These games are usually used in teaching corporate decision-making subjects and developing leadership competences. The next chapter presents our own gamified teaching method.

3. Methodology

The research was carried out in three phases.

1. Survey of student opinions motivation and attitude (questionnaire survey)
2. Development and implementation of a gamified course (the combined use of gamification tools and the evaluation of results in the teaching of a management subject)
3. A national survey on the use of gamification in higher education (questionnaire survey)

The study describes the ***second phase*** in detail, the first and final phases are presented outlined only for clarity.

3.1. Participants

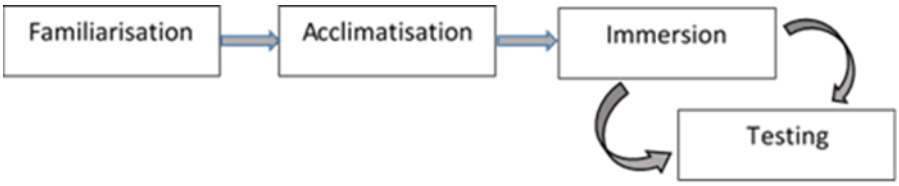
As a ***first step***, in the 2019/2020 school year, a quantitative research was conducted among students (260 participants) studying at the Faculty of Economics of a higher education institution, aimed to map students' learning motivation factors and preferred classroom tasks. Hypothesis testing revealed significant differences between the liking of gamified solutions and solving real problems (Pearson 0,341, 2 sign. 0,000<0,01), between internal motivation and gamified solutions (Pearson 0,129, 2 sign. 0,000<0,01), and between internal motivation and the liking of real problems (Pearson 0,466 2 sign. 0,000<0,01). Summarising the results, students driven by internal motivation liked real problems and were glad to solve them in a gamified form [50].

The second step

Based on the results of this phase, we prepared the gamified curriculum for 4th year students studying for a master's degree, for a seminar course related to a management subject, which was taught in the spring semester of 2020. The two main topics of the course were knowledge management and change management. The students had sufficient preliminary studies, and acquired the special knowledge of the subject necessary for the seminar during theoretical lessons. The course was taken by 68 students, divided into two seminar groups. Seminar classes were conducted on a weekly basis in two lessons.

3.2. Research design and procedures

The logical process of the course is shown in Figure 2 below.



Source: Authors' own construction

Figure 2. The logical process of the gamified course

After planning the process, the 'persona generation' phase helps with thinking. Its aim is to get to know participant motivation, which provides guidance for planning 'challenges'. In our research, persona generation was aided by the evaluation of student questionnaires (Phase 1 of the research). Accordingly, the characteristics of our 'persona' are: members of Generation Z, their learning is mainly driven by internal motivation, do not mind having to work harder if the task is interesting, like to solve real problems with the help of games, like to perform and present less, play some inline game every day and like strategy and logic games best.

The course began with an introductory session, where students got familiar with the new method, tasks, logic of progress, achievable levels, expected outcomes, potential pitfalls and opportunities for success.

3.3. Instruments

At the beginning of the semester, a virtual classroom was created on the Google Classroom site for students to join. With the help of Google Docs Editor, an Excel table called 'Progress Indicator' was created, in which everyone could keep track of their own and others' progress, completed tasks, the current status of points, levels and badges.

In the preparation for the course, students formed small groups of 7-8 people, and worked in a permanent composition throughout the semester. The background of gamified tasks was a self-invented company, which was freely chosen and built on students' creativity. They formulated the vision, mission, scope of activities, organisational framework and operation of the company, distributed the most important positions and named the main problem, for the solution of which the tasks received during the semester provided support. Nine companies were established, the problems of which could be solved in a 'customised way' through solving compulsory tasks. The activities and experienced problems of the established companies are collected in Table 1.

Table 1. Students' companies and main problems

Company activity	Problem
Marketing service	Few orders
Sale and cultivation of fruit and vegetable goods	Overchemicalised products
Manufacturing of bakery products, delivery to chain stores	Outdated technology, high costs, labour shortage
Catering unit – sale of craft beers	Unreliable suppliers, halting the supply of raw materials
Plumbing, electrical installation	Unskilled workforce
Diamond trading	Legal regulation as an obstacle
Events management	Few orders
Fitness	Few visitors, high costs

The tasks solved during the semester, built on each other in their logic, served to solve a company problem defined by the students, built on the theoretical curriculum (change and knowledge management). The first part of the tasks was aimed at identifying problems, delimiting them in the organisations of companies, then trying to solve them.

In addition to problem solving, based on the logic of Probst's model (Probst, 1998) (keeping in mind the rules of the relationships between the system approach and the processes), students had to work out conditions and steps for the implementation of a knowledge management system that ensures successful organisational operation. As each group elaborated the tasks for their own company, creative and unique solutions were created.

All the companies operated in the same 'virtual market', so it was an additional task to find a company among the others, with which they could enter into a mutually beneficial cooperation agreement to support the solution of the main problem. (Technique used was free to choose, which aroused great enthusiasm, and serious 'business negotiations' were held in the lesson. There was a group that reached a mutual agreement with all the other companies.)

In addition, problem solving and task completion was supported by film screenings, analyses, situational games and personality tests. They could test their own progress during the semester in the Kahoot program, using individual and group quizzes we had created.

3.4. Analysis technique

Some tasks were solved during lessons, while others had to be uploaded to the Google Classroom site. During the semester, they could collect 400 points (the so-called XP points known from video games), which belonged to eight levels (rookie, interested, inquisitive, knowledge-thirsty, eager-to-learn, hardworking apprentice, master, grandmaster). A virtual badge was also associated with each level, and progress could be tracked by following XP points on the 'Progress Indicator' interface. After completing a task, immediate feedback was provided with help of the evaluation of results and the collected points. At most fewer points, but no negative evaluation was not given, which provided them with motivation with an opportunity to reach a higher level. Students had the

opportunity to earn extra points by proposing a solution to a problem of a real company of their choice. Twice during the semester and in the final session, they demonstrated their progress in problem solving to the other companies in a presentation. By the end of the semester, all small businesses had met their main goal (problem solving), albeit at different levels.

The success of the method was measured in two ways. At the end of the semester, the participating students were asked to complete a brief questionnaire. Using closed-ended questions, students assessed the semester on a 4-point Likert scale, answering how much they agree with the provided statements (1-Not at all, 4-Totally agree). In the last, open-ended question, they were asked to give their honest opinions, suggestions, comments about the lessons. Another element of back-testing was the comparison of their learning results with those of the students in the previous year's non-gamified course. The detailed evaluation results are presented in the next chapters.

3.5. Evaluation of the semester

During course evaluation, 49 students expressed their opinions by answering questions summarised in 5 groups. In the first group of questions, respondents were asked to provide a general evaluation of the gamified seminar. The summarised results are shown in Table 2.

Table 2. General evaluation of the seminar (n=49)

Statements	Mean	Median	Modus	Standard deviation	% of students
I was not bored in class	3.15	3.00	3.00	.994	71.5
The classes were interesting	3.04	3.00	3.00	.856	73.4
I liked attending the classes	3.02	3.00	3.00	.892	73.5
I would have attended the classes even if it had not been compulsory	2.71	3.00	2.00	.995	57.1

The second group of questions investigated how the students experienced solving tasks through a self-created company, assuming a real market situation, which led to a solution to the main problem. The statistical evaluation of the results is shown in Table 3 below.

Table 3. Students' reception of a self-created company (n=49)

Statements	Mean	Median	Modus	Std. dev.	% of students
I would prefer if there was a similar opportunity for subjects as well	3.31	3.00	3.00	.748	89.8
I think gamification is a good idea	3.30	3.00	4.00	.832	89.8
I liked that we could be creative	3.23	3.00	4.00	.857	85.7

I liked that I could think about the task	3.15	3.00	3.00	.772	83.7
They were more interesting to me	3.14	3.00	3.00	.714	87.5
I thus better understood the curriculum	3.02	3.02	3.00	.978	75.5

Student feedback supported the results of the exploratory research. The results show that students evaluated the tasks developed for their own companies very positively. They could be creative as there was no predefined 'correct' solution. They found it interesting and exciting to solve a real problem and use their own ideas.

In the third group of ideas, students evaluated the system of points and badges. The statistical results of answers are summarised in Table 4.

Table 4. Evaluation of the system of points and badges (n=49)

Statements	Mean	Median	Modus	Standard deviation	% of students
I think it is a good idea	2.90	3.00	4.00	1.021	71.4
I would prefer a similar solution built in other subjects as well	2.90	3.00	4.00	1.115	67.4
Made the subject more interesting	2.80	3.00	3.00	.935	67.4
Increased the spirit of competition	2.55	3.00	3.00	.98	55.2

The results show that the system of points and badges had the least effect on motivation and competitiveness, but it still increased these in more than half of the students. Nearly three quarters found it a good idea and the majority believed they could better track their or progress and would have preferred to meet such an opportunity in other subjects as well.

The fourth group of questions explored student experiences with the Google Classroom site. The statistical results of the answers are summarised in Table 5.

Table 5. Evaluation of the use of Google Classroom (n=49)

Statement	Mean	Median	Modus	Standard deviation	% of students
Handling it did not cause any problems	3.56	4.00	4.00	.733	93.9
It was good to have all the information in one place	3.56	4.00	4.00	.611	95.9
I think it is a good idea	3.56	4.00	4.00	.705	87.8
I would prefer if there was a similar solution in other subjects as well	3.28	4.00	4.00	.935	77.5

The students were very positive about the online solution, and they quickly became familiarised with its handling. They took advantage of the opportunities provided by the site, and constantly followed their own and the others' progress. In the last, fifth group of questions, the students were asked to compare the gamified solutions of the course with the seminar lessons of other subjects. The statistical results of the answers are shown in Table 6.

Table 6. Comparison of the gamified seminar lesson with other seminar lessons (n=49)

Statements	Mean	Median	Modus	Standard deviation	% of students
The tasks were more creative	3.19	3.00	3.00	.77	83.7
The sessions were more interesting	3.08	3.00	3.00	.731	81.2
The sessions were not more boring	1.66	2.00	1.00	.788	89.7
The lessons were the same as before	1.92	2.00	2.00	.731	81.5

As the next step of evaluation, the study results of the students attending the gamified lessons were compared with those who attended the traditional course. Table 7 shows that the results of those studying with the new solution have significantly improved compared to the students attending the traditional course.

Table 7. Study results of gamified and traditional courses

Evaluations	Traditional course		Gamified course	
	Number of students	%	Number of students	%
A	5	8.2	13	19.1
B	10	16.4	13	19.1
C	10	16.4	21	30.9
D	18	29.5	9	13.2
E	15	24.6	7	10.3
FX	2	3.3	1	1.5
Did not attend	1	1.6	4	5.9
Total	61	100. 0	68	100.0

As the third step of the research, we asked 24 colleagues in higher education institutions to share their experience with and evaluations of gamification. 273 responses were evaluated during the questionnaire survey. Experiences with the application are summarised in Table 8.

Table 8. Lecturer opinions about gamified education

Application of the gamified method	N	%
Have not applied yet	142	52.0
Have applied, but mainly prefer traditional education	77	28.0
I apply traditional and gamified methods alternately	48	18.0
The application of the gamified method predominates	6	2.0
Total	273	100.0

The third step
It is interesting how two further responses illustrate the domestic picture of the method.

As an answer to the question 'What subject/subjects have you gamified or would like to gamify?' in most cases, foreign language education was marked, followed by the field of economics (management, marketing, corporate economics, micro and macroeconomics), and then mathematics. The diversity of the mentioned subjects confirms the wide applicability of the method: oral surgery, history, pedagogy, conflict management, communication, research methodology, bioinformatics, chemistry, constitutional law, mechanics, optics, heritage protection and food safety, etc.

Based on the respondents' opinion (273 participants), the advantages and disadvantages are summarised in Table 9 below.

Table 9. Advantages and disadvantages of gamification

Advantages	Mean	Disadvantages	Mean
Makes the learning process more enjoyable	4.32	It requires more preparation time on the part of the educator	4.23
Attracts student attention	4.27	Few publications discuss practical implementation	3.59
Positively influences student motivation	4.07	There is not enough theoretical information about the topic	3.55
Increases student activity	4.07	Its administration is more complicated	3.53
Increases competitiveness	3.66	Too student-centred	3.33
Knowledge is easier to transfer	3.60	The educator's preparation time is disproportionate to the usefulness of the method	3.23

Lecturer experience shows that the application of gamification in higher education makes knowledge transfer easier, attracts student attention, positively affects competitiveness, motivation and in-class activity. Preparation time was mentioned as the biggest disadvantage, but less think that the more preparation time is disproportionate to the usefulness of the method. Of course, not everyone agreed on the application of the method, as other answers show (not exhaustive list): gamification hides the importance of lexical knowledge, older students may find it too childish, teacher training is missing, it is not the task of the educator to motivate, students get too comfortable. However, few colleagues have direct personal experience. In the next chapter, we summarise our experiences in the light of former research results.

4. Discussion

Recent research works have proven the positive effect of gamification on user behaviour and motivation, but also that it does not have similar impact on everyone (Barak, 2020; Bencsik, Mezeiova, Seres Huszarik, & Tobias Kosar, 2019; Gokuüna & Gursoy, 2019). Our work has also confirmed them. The majority of

studies report a positive effect, but emphasise that gamification largely depends on users and context (Hamari, 2013).

The elements of game dynamics and game technics are closely related. The elements of mechanics brought dynamics with them, namely, points served as tools of rewarding, levels indicated current status, challenges satisfied their desire for performance, virtual assets helped in self-expression, ranking lists increased competitive instinct, gifts supported their being altruistic. These elements appear as fundamental expectations in the summary of research by Fromann, (2017) and Bunchball (2011). The solution we have developed meets these needs and practical experience has confirmed their raison d'être.

Aesthetics, as the third element of the model, describes the players' (students) emotional reactions during the game. These feelings can be achieved in more ways, depending on what they can be derived from. The method we have developed could provide the following from the 'roots' defined by Kusuma et al., 2018): trying something new, completing the challenge, belonging to the community, an opportunity for self-expression, immersion in the world of fantasy.

Fromann (2017) stated that there is no miracle recipe for a successful game or for participants to enjoy the game. He says gamification's immersive effects can be achieved through enforcing three conditions (or participant expectations). These (optimal workload, ideal levelling ideal reward system) were kept in mind when planning the semester.

Our results are supported by several studies that have shown that the application of the problem-based learning (PBL) model increases activity, and improves students' problem solving skills, (Simamora, Simamora & Sinaga, 2017) critical thinking skills (Najah, Rohmah & Susilo, 2019) and verbal communication skills (Kumar & Bervell, 2019). Several studies have shown that the ease of use and usefulness of Google Classroom has a positive effect on its spread in education (Zichermann and Cunningham, 2011; Wang et al, 2014; Wijava, 2016). This way of transferring information and knowledge (using Google Classroom) can be effectively used in educational activity inside and outside the classroom (Supriyanto, Setiawan & Budiarti, 2018).

In their study, Laskowski and Badurowicz (2014) report the results of a gamification course with students of an IT course where no significant relationship was found between class attendance and end-semester results. Students in the gamified course achieved worse results than the participants of the traditional course. A higher course attendance and an increase in the willingness to solve homework were recorded as positive results. Campillo-Ferrer and his colleagues (2020) used the well-known Kahoot program as a gamification tool in a Spanish university course. Their experiences were particularly positive in terms of students' active participation, their social relationships, the development of their interactivity, and their motivation to learn and solve tasks. Also building on the Kahoot program, experimental education was conducted by

Varannai and his colleagues (2017) who experienced a positive attitude, an increased student performance, and the acceptance of the use of the program. The positive effects of the Kahoot program were also reported by Prieto, Palma, Tobias & Leon (2019) in relation to teaching an operations management subject. These results support our research results, despite only one method was used from the tools that were part of the gamification training. Although experiences are rather positive, the studies note that the relationship between the invested amount of time, energy and costs and the results achieved needs to be weighed.

According to several researchers, education lacks a consistent understanding of processes used for gamifying learning activities (Borges, Durelli, Reis & Isotani, 2014; Ibanez, Di-Serio & Delgado-Kloos, 2014). There is no trained teaching team, which is true in our case as well. We and our colleagues, who apply them, prepare in the form of self-education. In many previous cases, inconsistency led to the failure of game experiments in education, which resulted in undesirable and unexpected effects on the learning processes and study results (Hakulinen & Auvinen, 2014; Hanus & Fox, 2015); Dominguez et al., 2012). Therefore, special attention should be paid to teacher preparedness. In addition, users may not be able to take advantage of opportunities and focus too much on end results (e.g. achieved position or ranking), and less on the tasks (Knaving & Bjork, 2013; Silpasuwanchai, Shigemasu & Ren, 2016). Gamified processes can also inspire users to behave appropriately only when it is rewarded (Bui, 2015). For many users, due to its simplicity or childishness, it may be demotivating (Augustin, Thiebes, Lins, Linden & Basten, 2016).

5. Conclusion

We considered the logic of the MDA (Mechanics, Dynamics, Aesthetics) model, well-known from the gamification theory, as the basis for the course design, keeping in mind the mechanics, dynamics and aesthetics of the gamified system, which elements are recommended by several earlier research works (Hamari, Koivisto & Sarsa, 2014; Zichermann & Cunningham, 2011). Based on these theoretical models, we built the gamified semester from elements that meet the expectations formulated by Fromann (2017) and Bunchmall (2011). They included challenges for participating groups, all 'companies' started with an equal chance, there was an opportunity to gain a reputation for their performance, the tasks had to be completed on time, to which obtainable points were pre-assigned. The opportunity to advance between levels was ensured, which could be tracked on a list prepared for this purpose. The system rewarded extra performance. During gamification, the combination of these elements – provided that it is foreseeable and known to the participants – ensure the successful achievements of goals (Bunchmall, 2011). The students were familiar with all the tasks, expectations, and they chose the main scope of company activities and the problem to be solved. This ensured that they were able to realise "the main goal" to be achieved (solving their own company's problem) by the end of the semester.

The gamified teaching solution contributed to raising participants' result to a higher level, but, of course, the student receptivity was not the same and the achieved results did not represent the same shift for everyone.

The mere implementation of the mechanisms of game techniques does not automatically lead to a significant increase in activity, but the users who actively kept track of their badges and those of their peers showed increased user activity. The methods used during the semester – solving the problem of a fictitious company invented by the students by associating special tasks – can be classified as problem-based learning (PBL). The students participating in the experiment liked that they could be creative (85,7%), and believed they could better understand the curriculum (75,5%). The lessons were interesting and they were glad to attend, they would be happy if further subjects were taught in a similar way. The built-in player feedback (badges) made the progress more interesting and traceable.

67.3% of the students felt that the Progress Indicator helped to assess their level of progress along with that of their peers. This tracking had a positive impact on their motivation and the building of healthy competitiveness). Managing the Google Classroom interface used in the course, on which they could track their own progress, points and badges, cause no difficulty, students easily learnt to use it (93,7 The course was considered more interesting and creative compared to traditional education. Learning outcomes at the end of the course showed a higher level than those in traditional education.

Overall, it was seen during the course that young people are most motivated by internal motivation, and they like to solve real problems in a gamified way (Bencsik et al., 2019), which facts were confirmed by our former research. According to the responses of 273 employees of 24 educational institutions, the advantage of the application of gamification is that it makes knowledge transfer easier, attracts the students' attention, has a positive impact on competitiveness and motivation, but, at the same time, requires much more effort from educators. After concluding our research (experimental teaching), we do not claim that the developed solution is perfect, but, compared to previous semesters, the students were able to achieve better results. Conclusions have been drawn from the experiences, which will be incorporated into the gamified solution of the next course.

6. Limitations of the research

The most significant limitation was the opportunity to apply the method. We managed to try the new method on a relatively small course, so our results are true only for the observed course and the students participating in the experiment. Thus, the results cannot be generalized. Another limitation to mention was the lecturers' inexperience, which may distort student opinions. It is also possible that what they felt as a problem of the method was actually a consequence of the lecturers' inexperience. It is also a problem and influences the success of the course that during the course the students cannot yet get involved in the use of similar methods in the case of other subjects.

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