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STUDENTS' ENGAGEMENT AND MOTIVATION IN GAMIFIED LEARNING

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Abstract

Recently, technology has been increasingly integrated into higher education through gamified learning, which applies game design principles to educational content. The purpose of the present paper is to assess and depict the engagement of students in the field of economics and business in gamified learning and to understand the relationship between engagement and motivation in gamified learning, elements less studied in the context of economics and business higher education, as shown in the literature. The paper proposes an original approach both in terms of the research method and the context of the study.

In order to analyse engagement in gamified learning, we use Nicola Whitton's scale and employ an exploratory factor analysis on data collected through a questionnaire-based survey distributed among students at one of the largest universities of economics and business in Romania, namely The Bucharest University of Economic Studies (BUES). The analysis reveals three specific engagement factors: the first factor represents interest in new challenges; the second factor reflects immersion in gamified learning and satisfaction of completing; the third factor is related to students' purposes and clarity of the goals. Our results show that all factors exhibit positive associations with student learning motivation, while the first factor also indicates an association with the gender of the respondents. A good understanding of these factors can contribute to improving the teaching process by integrating gamification into teaching activities.

Keywords: gamified learning, learning motivation, engagement, internship, skills, higher education.

JEL Classification: A2, A23, I21

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Introduction

The use of Information and Communication Technology (ICT) in education has become increasingly prevalent in recent years. It has transformed the way teaching and learning are conducted, providing new opportunities and resources for educators and students. Technology enabled the development and implementation of various digital learning tools such as educational websites, interactive simulations, multimedia presentations, and online learning platforms. These tools offer engaging and interactive learning experiences that allow students to access and use educational resources anytime, anywhere. The COVID-19 experience also fostered the digitalisation of education: students discovered the unlimited opportunities offered by the online environment, and teachers discovered unexplored online resources, methods, and tools for teaching and research (Dima, Busu and Vargas, 2023).

Recently, technology has become more involved in higher education through gamified learning. Gamified learning refers to the use of game elements and mechanics in the context of education and learning. It involves incorporating elements commonly found in games, such as point systems, rewards, levels, leader boards, competition, and storytelling, into the learning process to enhance engagement, motivation, and improve the overall learning experience.

Gamified learning is increasingly popular in higher education, and is applied in various educational settings, including university classes, online courses, corporate training, and language learning platforms. It has the potential to increase student engagement, improve knowledge retention, and develop problem-solving and critical thinking skills through interactive and meaningful learning experiences (Smiderle et al., 2020).

The research question addressed in this study concerns the identification of elements and mechanisms to be used to increase the participation and motivation of participants in gamified learning. We aim to bring to the fore how commitment and motivation are associated in the context of gamified learning activities delivered during an internship programme for students, as well as whether the commitment of students is different depending on their demographic characteristics (for example, the gender of the respondents).

In this context, this study follows an exploratory approach, and the purpose is twofold, respectively, first to assess and depict students' participation in gamified learning, in the case of economic and higher education of businesses, and secondly to provide a deeper understanding of the correlation between participation and motivation in gamified learning.

The case study of the article is focused on economics and higher education in business in Romania and the case of a gamified competition used within an internship programme is analysed. A highly relevant topic in the academic literature on the subject of career success is represented by aspects preceding the start of a career, such as practical training programmes during university, which take the form of internships in many cases (Covrig et al., 2022; Jansen et al., 2022).

The use of gamification in internship programmes adds a layer of excitement, motivation, and participation to the learning experience. By utilising game elements, the university can create a more dynamic and interactive environment that fosters interns' learning, skill acquisition, and overall satisfaction with the internship programme.

We rely on the widely recognised work of Nakamura and Csikszentmihalyi (2009) and their flow theory, which proposes that individuals are most motivated and engaged when they experience a state of flow, characterised by deep concentration, enjoyment, and a

sense of being fully involved in an activity. Flow occurs when the challenge of a task matches an individual's skill level, providing a balance between perceived difficulty and perceived capability.

Engagement in gamified learning is assessed using the scale developed by Nicola Whitton (2010). The scale measures the level of engagement of a particular learning experience that captures the perceptions of the respondents related to the experience. Using the data collected for the 18 items, we employ an exploratory factor analysis aimed at identifying specific engagement factors.

Data collection was carried out within the project “Practice smart your development - PRIDE-U”, co-financed by the European Union and implemented at BUES. The students involved in the project participated in a gamified competition with various tasks and activities related to the purpose of their internship programme. The project was developed for economics and business students, and their participation in the gamified learning competition encouraged the development of their practical skills and competencies. The originality of this paper consists both in the methodological approach and in the contextualisation of the analysis on the economic and business field at the university level in Romania, within BUES.

In terms of structure, the paper continues with the presentation of the theoretical framework in relation to the latest results in the field, followed by a description of the research methodology, after which the results are presented and commented on, while the final section concludes the paper.

1. Theoretical framework

Games are a significant activity during our childhood and help us develop, compete, and learn in a funny and attractive manner. Even as adults, we enjoy playing games. It is proven by the disruptive mobile games industry, the most powerful entertainment industry in economic terms. Using technology and games for educational purposes has extended the traditional learning paradigm to mobile learning (Su and Cheng, 2015) and gamification. Although the use of games in training is not new, gamification is a relatively new concept in learning and development, which uses elements from digital games in the process of education.

The concept of gamification has captured the attention of both academics and practitioners in various fields such as education, computer science, human-computer interaction studies, and even healthcare. However, the conceptual boundaries have not yet been reached, and there is a multitude of definitions and recommendations regarding its use. A common definition provided by prominent researchers in the field (Deterding et al., 2011; Deterding, 2012; Domínguez et al., 2013) states that gamification implies the use of game design elements and mechanism in non-game context to enhance the engagement of the users. It can be implemented both in digital environments and non-digital environments (Martí-Parreño et al., 2019) and also in a mixed context. In this regard, the study conducted by Su and Cheng (2015) brings forward evidence that students like outdoor learning activities facilitated by smartphones, which allow them to complete remote the learning tasks. Well-designed gamified systems create opportunities for learners and offer spontaneous feedback while enhancing their knowledge through academic tasks (Bouchrika et al., 2021).

Gamification is increasingly being applied in different areas: from marketing (Lucassen and Jansen, 2014; Hsu and Chen, 2018; Singh, Kumar and Jain, 2021), innovation (Procopie et al., 2015), sustainability (Douglas and Brauer, 2021; Whittaker, Mulcahy and Russell-Bennett, 2021) to different business contexts (Larson, 2020; Wunderlich et al., 2020) and of course education (Dichev and Dicheva, 2017). In education gamification is used both in schools (Toma, Diaconu and Popescu, 2021) and universities (De-Marcos et al., 2014; Fernández-Gavira et al., 2021; Beranič and Heričko, 2022) and for employee training (Cechella, Abbad and Wagner, 2021; Wang, Hsu and Fang, 2022).

Various research (Barata et al., 2013; Giang, 2013; Hamari, 2017) highlights the idea that educational games seem to be a valuable practical approach to learning and teaching, with positive effects on learning/training outcomes. By applying gamification in the educational process, users (pupils, students, etc.) are motivated to be present, to engage and actively participate in the learning process given the joy of the game, the opportunity to win, and the idea of being in competition with peers. Offered a fun and often familiar environment, learners are motivated to be actively involved, to reach a higher level in the game, and thus knowledge is more easily assimilated. The ability to accumulate new skills increases, and according to Giang's (2013) study, the increase reaches 40%. Díaz-Ramírez (2020) conducted a study on engineering education, the statistical results providing empirical evidence of the positive effects of gamification on school performance and other desirable social behaviours such as the sense of belonging and teamwork. However, research analysing the use of gamification in economics and business higher education is limited, especially in Eastern Europe.

Although most studies highlight the positive effects that gamification can have on the learning process, there are authors who draw attention to mixed and potential negative effects (Koivisto and Hamari, 2015). In this respect, Andrade, Mizoguchi and Isotani (2016) point out that some game elements that stimulate competition (such as ranking, levels) can negatively affect learners with lower performance and who do not want to be involved in such competitions. In addition to undesired competition, the authors also address other issues that could result from the use of gamification in the educational process, such as addictions and off-task behaviour. Hanus and Fox's (2015) longitudinal study over one semester reveals that the use of common gamification techniques in a communication course at an American university did not lead to better academic performance (as assessed by grades), but instead negatively affected motivation, satisfaction, and responsibility. Students in a parallel course where no gamification elements were introduced performed better, which would suggest caution when applying gamification mechanisms in an educational context. Another issue in gamified learning is represented by the excessive focus of students on extrinsic motivators instead of on learning outcomes.

The negative effects of gamification can be avoided or diminished through proper design. Designing a successful gamification process is challenging and it should be based on the assumption that the individual traits of learners can fundamentally impact the experience they have in the gamified learning process. Authors such as Codish and Ravid (2017) and Denden et al. (2021) examine the effects that gender and personality traits can have on students' perceptions of gamification. The results show that gender and personality can affect the perceptions of different elements of the game. Buckley and Doyle (2017) examine the impact that different learning styles and personality traits have on game players. Research findings show that people who have an active learning style are more

prone to learn efficiently through gamification. It is also observed that extroverted individuals like gamification, while conscientious individuals are less motivated by it. The key finding of these studies is that gamified learning must be designed and implemented in a customised manner, considering the demographic aspects of the target group, as well as individual learning styles and personality traits.

There is a prevalent opinion that nowadays pupils and students are less and less involved in classical learning activities, recent studies emphasising the fact that a significant percentage of them exhibit a low participation and/or a low sense of belonging in a traditional education setting and teachers are not able to engage them in the learning process (De-Marcos et al., 2014; Hamari et al., 2016; Su and Cheng, 2015). Gamification has been used successfully in many web-based businesses to increase user engagement, research suggesting that the use of technology in the learning process might be a means of increasing motivation, engagement, and the sense of fulfilment (Domínguez et al., 2013). New generations expect learning to be interesting, challenging, and fun. Learning and development specialists are trying to take advantage of the enormous potential of gamification and use its features to increase motivation and learning engagement. Several studies support the fact that well-designed computer games can engage learners more and promote an effective learning environment (Kalogiannakis, Papadakis and Zourmpakis, 2021; Whitton, 2010, 2011). Thus, applying gamification in a pedagogical context could be a remedy for many students who feel disengaged from traditional teaching methods and could provide a partial solution to the decrease in students' motivation and engagement with educational systems currently faced (Alsawaier, 2018). Universities could greatly benefit from gamification of both high school graduate recruitment strategies and the content of university courses and curricula (Alsawaier, 2018). Gamification can play an important role when used in the learning process by increasing student engagement and learning, which will also lead to higher motivation levels of those students (Surendeleg et al., 2014).

According to the Association for Project Management (2014), the main function that gamification can provide relates to improving a situation through the use of game mechanics, whose benefits include (i) increased engagement; (ii) increased levels of motivation; (iii) increased user interaction; and (iv) increased loyalty. Two of these benefits, frequently quoted in the scientific literature, namely increased engagement and increased level of motivation, are analysed and assessed also in the present paper, while the relationship between them is also explored. Few studies explicitly address the link between engagement and motivation, and this paper addresses this gap in the literature.

2. Research methodology

The present research on the engagement and motivation of students in gamified learning was conducted within the project “Practice smart your development - PRIDE-U” implemented in BUES between September 2020 and March 2023. The project aimed at developing professional skills of students in the business environment through several means, including internships, psychological profile evaluation and a gamified learning competition.

The gamified competition, named VRunners, developed by Equatorial Gaming S.A., is an alternate reality game that simulates a marathon. It works as a learning game developed in the online environment, in which each student has the opportunity to compete virtually with the other colleagues enrolled in the target group and win the game.

The main purpose of this competition is to give students the opportunity to capitalise on their various skills in economics, management, or IT, by registering and getting involved in the game. Therefore, the gamified competition is based on concrete tasks related to various professional areas. Students in the target group must solve various challenges in a given time frame. The challenges proposed in the gamification learning platform were created by professors, trainers, and also professionals from more than 50 companies that were actively involved in the project and covered 12 areas of competencies.

The gamified competition took place between November 2021 and September 2022. 136 BUES students actually created an account on the gamified learning platform, while 100 were active players.

The data used in this research were collected from participants in the gamified competition through one of the proposed challenges. The students were requested to complete the research questionnaire and to express their level of participation in the gamified competition. Participation was voluntary. The questionnaire consisted of questions on the general attitude of the respondents toward playing computer games and items from the Whitton scale (2010b) used to evaluate their participation in gamified learning. Finally, the sample consisted of 100 participants. As all have direct experience with gamified learning, the sample is adequate to answer the research questions regarding their engagement and motivation in the educational game. Since the selection was based on convenience, it is not feasible to generalise the results, which is beyond the scope of this research.

Table no. 1 depicts the sample distribution by the main demographic variables, such as age, gender, education, and general involvement in playing games. Overall, the proportion of women (78%) is significantly higher than that of men (22%), most of the respondents being in their 20s, which was expected as they pursue undergraduate (68%) and master studies (32%). An important percentage of the participants declare that they do not play games in the present (34%). However, more than a half declare they occasionally play games, while 8% do this on a regular basis. When asked about the type of games they prefer to play, most of the respondents choose strategy, multi-player, and adventure games. The main three reasons they choose to play are: for a mental challenge, for playing with others, and because of boredom.

Table no. 1. Sample distribution

Variable	Levels	<i>n</i>	%
Gender	Female	78	78
	Male	22	22
Age	Under 20	22	22
	21-25	72	72
	26-30	2	2
	31-35	2	2
	Over 35	2	2
Level of studies	Undergraduate	68	68
	Master student	32	32
Do you play computer games?	Never	34	34
	Occasionally	57	57
	Regularly	8	8

Source: authors' elaboration on sample data

In this study, the engagement of students in the gamified learning process, specifically in the VRrunners competition, was assessed using the attitudinal scale created by Nicola Whitton (2010 and 2011). The Whitton scale measures the levels of engagement of adult game-based learning by asking them about their personal perception of the learning experience. The 18-item five-point Likert scale is meant to measure post-experiential engagement with educational games. Based on flow theory (Csikszentmihalyi, 1992), adult learning theory (Knowles, 1998) and Nicola Whitton's own qualitative research, the scale is postulated to comprise five dimensions:

- Perception of challenge: indicates the motivation to complete the activity, the clarity of the tasks, and the relevance of the final achieved result.
- Perception of control: implies the learner's perception of fairness, the options available in the environment; speed, and the available feedback.
- Immersion: regards the absorption of the learning activity.
- Interest: regards the intrinsic interest in completing the activity.
- Purpose: refers to the value perceived by learners in the context of their study objectives.

To identify the number and nature of factors that influence student participation in gamified learning activities, we used exploratory factor analysis (EFA) as the main research method. As the scale used in the research is the result of theoretical reasoning and qualitative analyses, we did not assume from the very beginning that the five factors involved in the scale influence the engagement of students and applied this quantitative analysis technique. EFA is suitable in our case because it provides robust results in a relatively small volume sample, but with high homogeneity. The methodology based on factorial analysis has also been used in several studies, of which we mention: Băcilă et al. (2014), which analyses the behaviour and satisfaction of students from business faculties; Varannai, Sasvári and Urbanovics (2017), which studies students' behaviour in a context of Kahoot! type gamified learning or Aguiar-Castillo et al. (2020), which explores the intention and motivation of students in the field of hospitality to use a gamified application as a complementary strategy to a traditional learning system.

According to Kabacoff (2022), EFA is a collection of methods designed to reveal the latent structure of a given set of values. The method looks for a smaller set of latent variables that can explain the relationships between manifest variables. The primary goal of using the EFA in this research was to examine the interrelationships between the elements and to identify a smaller number of latent factors that can explain the patterns of covariation between the variables and to measure the participation of the participants in the VRrunners competition. By reducing the dimensionality of the data, EFA helps to uncover the hidden structure and simplify the interpretation of the data. EFA analyses the patterns of correlations or covariances between the initial variables and identifies factors based on the shared variance between them. Each factor represents a common underlying dimension or concept that contributes to the observed correlations among the items. Before running the EFA, we conducted a correlation analysis on the items, calculating the polycoric correlation coefficients, as well as KMO, the Kaiser-Meyer-Olkin sample adequacy measure. The Bartlett sphericity test was applied to investigate whether the data is suitable for a size reduction method. After applying AFE, descriptive statistics were calculated for the

resulting factors. The last part of the statistical analysis consisted of performing non-parametric Kruskal-Wallis tests, considering different categorical variables as grouping variables, the numerical variable being represented by each of the factors resulting from the EFA, as well as in the correlation analysis to identify whether there is a significant association between the engagement factors and gamified learning motivation.

3. Results and discussions

3.1. Motivation of students in gamified learning

Motivation to learn is one of the variables of interest in our research. When asked about the idea of learning with a game, 43% consider to be moderately motivated to learn, 41% declare themselves strongly motivated to learn, while the rest do not feel motivated by the gamified learning. These results are similar to those obtained by Chapman and Rich (2018), in whose research about 70% of students declared that learning through gamification was more motivating or much more motivating than traditional courses, the most motivating elements of the game being the points obtained, bonuses and penalties for meeting deadlines, flexibility of deadlines and grade indicators. This outcome is also in line with other research results (Domínguez et al., 2013; Surendeleg et al., 2014; Alsawaier, 2018; Kalogiannakis, Papadakis and Zourmpakis, 2021), suggesting that gamification may be regarded as an incentive for learning and it should be taken into consideration when establishing learning programmes in higher education. Through gamification, the educational experience can be improved, varied, perceived as modern, and transparent, being an alternative to traditional education or a way to vary the educational act.

3.2. Students' engagement in gamified learning

The engagement of students in the gamified learning experience was explored using the scale of the engagement questionnaire developed by Whitton (2010 and 2011). The 18 items are measured on the ordinal 5-point Likert scale, where 1 means "Strongly disagree", and 5 means "Strongly agree". Some of the items identified with the letter r in Table no. 2, have negative valences and therefore they were reversely coded. Descriptive statistics displayed in Table no. 2 show that the mean scores of the items range between 3.29 and 4.08, and six (one third) of the items have means greater than 4. The highest means are exhibited by items related to the utility of the activities (E_9_r), the feeling of being able to achieve the goal of the activity (E_3) and the joy perceived during performing the activity (E_16_r). Except item E_10_r, related to the interest in exploring the options available on the platform, with a skewness coefficient of almost 0, all the other items have negative asymmetry, and higher values of the Likert scale prevail in the sample.

Table no. 2. Descriptive statistics of the items

Items	Items	Mean	St. dev.	Median	min	max	skew	kurtosis	St. error	Coef. of variation
E_1	I wanted to complete the activity	3.88	1.01	4.0	1	5	-0.41	-0.78	0.10	25.98%
E_2_r	I found the activity frustrating	3.90	0.99	4.0	1	5	-0.48	-0.61	0.10	25.38%

Items	Items	Mean	St. dev.	Median	min	max	skew	kurtosis	St. error	Coef. of variation
E_3	I felt that I could achieve the goal of the activity	4.06	0.91	4.0	1	5	-0.92	0.89	0.09	22.37%
E_4	I knew what I had to do to complete the activity	3.99	0.85	4.0	2	5	-0.28	-0.93	0.08	21.22%
E_5_r	I found the activity boring	3.81	1.03	4.0	1	5	-0.44	-0.55	0.10	27.08%
E_6_r	It wasn't clear what I could and couldn't do	3.66	1.10	3.5	1	5	-0.25	-0.80	0.11	30.14%
E_7	It was clear what I could learn from the activity	4.01	0.86	4.0	1	5	-0.68	0.36	0.09	21.41%
E_8	I felt absorbed in the activity	3.36	1.14	3.0	1	5	-0.40	-0.42	0.11	33.98%
E_9_r	The activity was pointless	4.08	0.96	4.0	1	5	-0.63	-0.48	0.10	23.55%
E_10_r	I was not interested in exploring the options available	3.29	1.23	3.0	1	5	0.02	-1.11	0.12	37.49%
E_11_r	I did not care how the activity ended	3.78	1.13	4.0	1	5	-0.52	-0.57	0.11	29.98%
E_12	I felt that time passed quickly	3.79	0.88	4.0	2	5	-0.11	-0.90	0.09	23.21%
E_13	I found the activity satisfying	4.01	0.96	4.0	1	5	-0.77	0.24	0.10	23.91%
E_14_r	The activity did not let me do what I wanted	3.84	1.03	4.0	1	5	-0.39	-0.64	0.10	26.88%
E_15_r	I was unable to tell what effect my actions had on me	3.56	1.01	3.0	1	5	-0.16	-0.39	0.10	28.32%
E16_r	I did not enjoy the activity	4.04	1.01	4.0	1	5	-0.71	-0.46	0.10	25.11%
E17	Feedback I received was useful	4.03	0.92	4.0	1	5	-0.76	0.50	0.09	22.71%
E18	I found it	3.91	0.95	4.0	1	5	-0.65	0.40	0.10	24.41%

Items	Items	Mean	St. dev.	Median	min	max	skew	kurtosis	St. error	Coef. of variation
	easy to get started									

Source: authors' elaboration on sample data

Our results show that the level of participation of students in gamified activities is generally high. Furthermore, the results are in line with other studies conducted in higher education, gamification being considered a learning tool that increases interactivity and engagement (Domínguez et al., 2013; Smiderle et al., 2020; Bouchrika et al., 2021). The results of Huang, Hew and Lo (2019) indicate that gamification increases student participation in flipped learning courses, and students engaged in gamification are more willing to complete pre- and post-course activities and achieve better test scores.

The multivariate normal distribution for the group of 18 items was tested using the Mardia multivariate normality test in R and the results showed that the null hypothesis of the multivariate normal distribution was rejected (skewness statistic was 2910.9196, p-value< 0.0001 kurtosis statistic was 24.4691, p-value< 0.0001). The Anderson-Darling test for the univariate normal distribution of each of the items shows that none of them followed a normal distribution.

Given that the data on each item are ordinal with 5-point Likert scale, as well as given the fact that the ordinal data are not symmetrical, we used polychoric correlation coefficients, as an alternative to Pearson or rank correlation (Watkins, 2020). Figure no. 1 presents the polychoric correlation matrix between all items, with almost 92% of all correlation coefficients being above 0.3 in absolute value. Most of the coefficients exhibited a medium to large correlation, confirming the existence of a significant relationship between the items. In Figure no. 1 we can visualise the intensity of correlation: the more intense the blue colour, the stronger the correlation.

To investigate whether the data were suitable for EFA, Bartlett's test of sphericity was applied. It confirmed that the data were in favour of the alternative hypothesis, the polychoric correlation matrix is significantly different from the unit matrix (the value of the test statistic was $\chi^2(153)=1943.055$, with a p-value smaller than 0.0001). In addition, the value 0.791, greater than 0.7, of the Kaiser-Meyer-Olkin measure of sampling adequacy recommends that the data are appropriate for EFA.

The next step was to decide on the number of factors. The parallel analysis and the Kaiser method indicated three factors to be retained. Using the R package 'psych' (Revelle, 2023), EFA was carried out with three factors, polychoric correlation matrix, 'varimax' rotation, and principal axis (principal axis factoring or PA) as a method of estimation. The standardised loadings (or the pattern matrix), shown in Table no. 3, are the correlation coefficients between each factor and the 18 elements. For each item, the bold coefficients correspond to the factor with which that item is more strongly correlated. The items were listed in decreasing order of the loadings for each factor, this way facilitating the interpretation of each latent underlying construct.

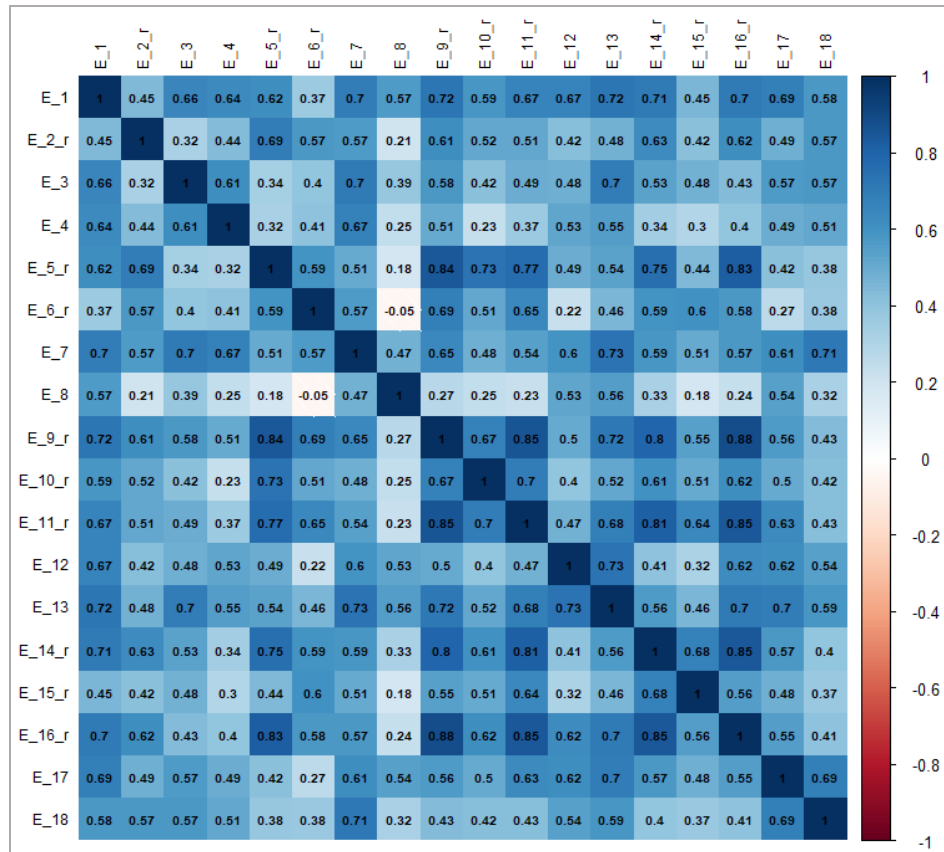


Figure no. 1. Polychoric correlation coefficients matrix

Table no. 3. Standardised loadings (pattern matrix)

Items	F1	F2	F3	Communality h^2
E_5_r	0.868	0.195	0.129	0.809
E_16_r	0.854	0.338	0.170	0.872
E_11_r	0.841	0.269	0.225	0.831
E_9_r	0.827	0.267	0.331	0.865
E_14_r	0.808	0.271	0.234	0.781
E_6_r	0.681	-0.245	0.544	0.819
E_10_r	0.680	0.244	0.189	0.558
E_2_r	0.573	0.143	0.390	0.501
E_15_r	0.560	0.108	0.355	0.451
E_8	0.044	0.731	0.145	0.557
E_12	0.299	0.649	0.326	0.618
E_1	0.489	0.639	0.384	0.795
E_17	0.356	0.615	0.403	0.668
E_13	0.442	0.606	0.461	0.775
E_7	0.361	0.391	0.739	0.830

Items	F1	F2	F3	Communality h ²
E_4	0.181	0.307	0.660	0.563
E_18	0.235	0.378	0.622	0.585
E_3	0.269	0.406	0.610	0.610

Source: authors' elaboration on sample data

Note: E_1-E_18= items codification (see Table no. 2); F1-F3 =Factor 1- Factor 3

The first factor is associated with all the negative items, such as “*I found the activity boring*”, “*I did not enjoy the activity*”, “*I did not care how the activity ended*” and so on. Therefore, these underlying elements suggest resistance and lack of interest in engaging in new challenges, different from those of a traditional learning system. As the items with which this factor is more strongly correlated are reverse coded, we appreciate that this factor actually represents the dimension of interest in gamified learning challenges, other than those offered by a classical learning system. Consequently, the first factor is labelled **F1 – “interest and perception of the challenge”**.

Items such as “*I felt absorbed in the activity*”, “*I felt that time passed quickly*”, “*I wanted to complete the activity*”, “*Feedback I was given was useful*”, “*I found the activity satisfying*” have high loadings on the second factor. Therefore, this factor reflects the appreciation of the challenge-solving journey and the satisfaction derived from completing the tasks; therefore, we called it **F2 – “immersion in gamified learning and satisfaction of completing”**.

The last four items are presented in Table no. 3, “*It was clear what I could learn from the activity*”, “*I knew what I had to do to complete the activity*”, “*I found it easy to start*”, and “*I felt I could achieve the goal of the activity*”, focussing mainly on the third factor. This factor describes the adaptability and self-confidence of the students in completing the tasks and is named **F3 – “purpose and clarity of goals”**.

Whitton (2010 and 2011) proposes a scale covering five potential factors explaining engagement: perceived challenge, perceived control, interest, immersion, and purpose, which are the result of theoretical and qualitative analyses. The factors resulting from the factor analysis of this exploratory research overlap with the five dimensions of the Whitton scale, but a fusion of them into three factors, considered relevant, is found. Furthermore, our results suggest the association of the purpose of the challenge with the clarity of the game's objectives (F3), which become highly relevant for the students in the studied group. These differences may be specific to generation Z, much more exposed to interaction with the online environment, more informed and demanding than the 'millennial generation'.

The students' engagement is strongly influenced by how interesting and challenging the activity is. It is important that the gamified experience provides them with clear activities, with different options available that are enjoyable and not boring. Students' emotional engagement increases if the design of the learning environment is carefully designed (Schöbel, Janson and Leimeister, 2023). Gamified activities that provide clear paths for reaching the final results are also appreciated by respondents, with the engagement being influenced by the satisfaction of completing the activity. The study conducted by Leaning (2015) reports a change in the psychological approach to learning through gamification, students reporting that they worked harder, read more, and gamification influenced their attitude and effort allocated to learning.

The three engagement factors presented above accounted for 69.4% of the total variance. The first factor accounted for 33.6% of the total variance and 48.4% of the common variance, the second factor accounted for 18.1% of the total variance and 26.1 % of the common variance, and the third factor accounted for 17.7% of the total variance and 25.5% of the common variance. Cronbach's alpha was higher than 0.8 in all three cases, confirming a good internal consistency (Table no. 4).

Table no. 4. Cronbach's alpha and statistics related to the proportions of variance explained by the three factors

	Factor 1	Factor 2	Factor 3
Cronbach's alpha	0.926	0.819	0.847
Sum of Squared loadings	6.040	3.261	3.186
Proportion of Variance	0.336	0.181	0.177
Cumulative Proportion of Variance	0.336	0.517	0.694
Proportion Explained	$0.484 = 0.336/0.694$	$0.261 = 0.181/0.694$	$0.255 = 0.177/0.694$
Cumulative Proportion	0.48	0.74	1.00

Source: authors' elaboration on sample data

We analysed in detail the scores of the three engagement factors. Table no. 5 presents the descriptive statistics of the factors, including the three quartiles. All three factors exhibit negative skewness; however, the most negatively skewed factor is the first one, confirming that greater scores of the interest in gamified learning prevail in the sample. Factor 2 scores have an almost symmetrical distribution, since their skewness coefficient is almost 0.

Table no. 5. Descriptive statistics of the three identified factors

Factors	Mean	St. dev	min	Q ₁	Q ₂ = median	Q ₃	max	range	skew	kurtosis	St. error
Factor 1 – interest and perception of challenge	0	0.99	-2.66	-0.59	0.13	0.87	1.35	4.01	-0.78	0.16	0.09
Factor 2 - immersion in gamified learning and satisfaction of completing	0	0.96	-3.27	-0.74	0.07	0.66	2.27	5.54	-0.07	0.52	0.09
Factor 3 - purpose and clarity of goals	0	0.92	-3.25	-0.69	0.06	0.64	2.79	6.03	-0.21	0.69	0.09

Source: authors' elaboration on sample data

To achieve the research objectives, a more in-depth analysis was performed, as we were interested in whether there are significant differences for each of the three factors according to the gender of the students and the motivation for gamified learning of the students. In this respect, non-parametric Kruskal-Wallis tests were conducted. In the case of the first factor F1 - interest and perception of challenge, there are significant differences by gender at 10% significance level (p-value=0.0671, in Table no. 6). For the other two factors, F2

and F3, the results are not statistically significant (in the case of the F2 factor, $p\text{-value}=0.2058>0.05$, respectively for the F3 factor, $p\text{-value}=0.283>0.05$).

For the first factor F1, the medians of the groups are significantly different and there is stochastic dominance between the sexes. Female students show a greater interest in taking on the challenge of gamified learning than male students. They seem to be more inclined to assume risks and look for new learning experiences. This result is in line with the findings of Codish and Ravid (2017) and Denden et al. (2021), which also confirmed gender differences in gamified learning. Other studies also highlight the importance of understanding the effects of the demographics of different players in developing learning applications with specific audiences in mind (Welbers et al., 2019), recommending caution when generalising the results. However, once the challenge is taken, our results show no significant gender differences in how intense students are engaged in the gamified learning or in how they perceive the clarity of the game (see Table no. 6).

The students' responses to motivation in gamified learning through games were organised into the following three categories; the sample proportions are presented between brackets: *Neutral or unmotivated to learn through games* (16%), *Moderately motivated to learn through games* (43%), *Strongly motivated to learn through games* (41%).

For student motivation in gamified learning, the Kruskal-Wallis test was statistically significant for Factor 2 at 5%. For Factors 1 and 3 it turned out that the test is significant at the 10% level. Therefore, the result reveals that learning motivation affects all three dimensions of engagement (see Table 6).

Table no. 6. Kruskal-Wallis test for the three identified engagement factors, grouping variable: students' gender and students' gamified learning motivation

Grouping variable			F1 - interest and perception of challenge	F2 - immersion in gamified learning and satisfaction of completing	F3 - purpose and clarity of goals
	Students' Gender	Chi-Square	3.3528	1.6005	1.1528
		df	1	1	1
		p-value	0.0671<0.10	0.2058	0.283
	Students' gamified learning motivation	Chi-Square	4.9554	7.878	5.8662
		df	2	2	2
		p-value	0.0839<0.10	0.0195<0.05	0.0532<0.10

Source: authors' elaboration on sample data

The results show that for each factor, the smallest medians correspond to the group of respondents who are neutral or demotivated to learn through games. For the second factor F2 "immersion in gamified learning and satisfaction of completion" and the third factor F3 "purpose and clarity of goals", the highest medians are those of the group of students who are strongly motivated to learn through games, while for the first factor F1 "interest and perception of challenge", the medians of the moderately motivated and strongly motivated groups are almost equal, however much larger than the median of the demotivated students.

3.3. The relationship between engagement and motivation in gamified learning

The correlation analysis presented in the following (see Table no. 7) aims to offer information on the second research objective, which refers to the relationship or association between each of the three identified engagement factors and the ordinal variable of the motivation for gamified learning of the students. Kendall rank and Spearman rank correlation coefficients were calculated, and hypothesis testing was conducted. The alternative hypothesis was "correlation coefficient greater than 0". The results from Table no. 7 show that the data are in favour of a positive and statistically significant correlation between each of the three engagement factors and students gamified learning motivation, at significance levels of 5%, 1%, and 1%. Furthermore, we found the strongest association between learning motivation of the students and Factor 2, immersion in gamified learning, and satisfaction with the completion.

Table no. 7. Rank correlations between the ordinal variable of gamified learning motivation and the three identified engagement factors

			F1 - interest and perception of challenge	F2 - immersion in gamified learning and satisfaction of completing	F3 - purpose and clarity of goals
Kendall's rank correlation tau	Students gamified learning motivation	Correlation Coefficient	0.1695744*	0.2315**	0.1962**
		p-value for one tailed test "greater"	0.0158<0.05	0.0017<0.01	0.00645<0.01
Spearman's rank correlation rho	Students gamified learning motivation	Correlation Coefficient	0.2186*	0.2821**	0.2398**
		p-value for one tailed test "greater"	0.0144<0.05	0.0022<0.01	0.0081<0.01

Source: authors' elaboration on sample data

Therefore, our results show that students who are more motivated to learn will express greater engagement in gamified learning in all its three dimensions. This outcome confirms that well-designed computer games can engage learners more and promote an effective learning environment (Kalogiannakis, Papadakis and Zourmpakis, 2021; Boboc et al., 2023).

Conclusions

The objective of this paper was to evaluate and explain the level of students' participation in gamified learning within the context of business and economics higher education. Additionally, we also aimed to examine the connection between the participation of economic and business students and motivation in learning through educational games. To analyse engagement in gamified learning, we utilise Nicola Whitton's scale and perform an exploratory factor analysis on the data collected.

The factor analysis reveals three distinct factors related to engagement. The first factor represents an interest in facing new challenges, the second factor reflects immersion in

gamified learning and the satisfaction of completing tasks, and the third factor is associated with students' objectives and the clarity of goals. Our findings indicate that all of these factors exhibit positive associations with student learning motivation. Furthermore, the first factor also shows an association with the gender of the respondents. The results also demonstrate that highly motivated students are more likely to engage deeply in gamified learning in all three dimensions. This confirms the idea that well-designed educational computer games can effectively engage learners and foster an optimal learning environment (Kalogiannakis, Papadakis and Zourmpakis, 2021).

The results provide new and valuable insights on how students in economics and business perceive engagement in gamified learning. The article has an original approach, both from the point of view of the analysis method and of the investigated case study.

This study is supported by a homogeneous sample of 100 students in economics and business who simultaneously participated in the same gamified learning competition. However, one limitation of the study, which is exploratory in nature, is that the results may not be generalised to students from other educational domains, as the sample was conveniently selected and different educational background and relation to gamified learning may differently impact engagement. Another limitation is geographical; all students come from a university in Romania. The study opens up new research directions by replicating the methodology used to analyse gamified learning in other fields of higher education. Furthermore, future studies can contribute to identifying causal relationships between engagement, motivation, and possibly gamified learning outcomes. Methods based on simultaneous equation models represent alternatives for data analysis for larger sample sizes.

A key takeaway from existing studies is that gamified learning should be tailored according to the specific characteristics of the target group, including demographic aspects, individual learning styles, and personality traits. Designing and implementing gamified learning experiences with these considerations in mind is crucial to achieving optimal results. A better understanding of the mechanisms that determine the motivation and engagement of economics and business students in learning through games, as well as other elements that influence their involvement and motivation, is essential for the development of engaging and effective games that improve the didactic process and learning outcomes. The results of this study can be useful to teachers who use gamification in the teaching process, to organisations that develop educational games, and to decision makers at the university level who can influence various decisions such as including gamification in the curriculum, training teachers to use gamification in the didactic process, etc.

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